System Impact Study
PID 260
140.8 MW Plant

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Executive Summary

This System Impact Study is the second step of the interconnection process and is based on the PID 260 request for interconnection on Entergy's transmission system between the proposed Grandview 161kV substation (located on the Eureka Springs–Table Rock 161kV transmission line) and the Osage 161kV substation. This is a proposed 161kV transmission line.

Requestor for PID 260 requested ERIS and NRIS. Under ERIS, a load flow analysis was performed. PID 260 will be a new generation unit. The study evaluates connection of 140.8MW to the Entergy Transmission System. The load flow study was performed on the latest available 2015 Summer Peak Case, using PSS/E and MUST software by Siemens Power Technologies International (Siemens-PTI). The short circuit study was performed on the Entergy system short circuit model using ASPEN software. The proposed in-service date for ERIS is December 31, 2014. Under the NRIS, the analysis was performed on the 2014–2019 summer and winter models. These models included Entergy's latest construction plan upgrades.

This report is organized in four sections, namely; Energy Resource Interconnection Service (ERIS), Network Resource Interconnection (NRIS), Short Circuit/Breaker Rating Analysis, and Stability Study. The ERIS section includes load flow (steady state) analysis. The NRIS section contains details of load flow (steady state) analysis. Transient stability analysis found in the Stability Study and Short Circuit Analysis as defined in FERC orders 2003, 2003A and 2003B for ERIS are also applicable to NRIS.

Results of the System Impact Study indicated that under ERIS/NRIS the additional generation due to PID 260 generator **does not** cause an increase in short circuit current such that they exceed the fault interrupting capability of the high voltage circuit breakers within the vicinity of the PID 260 plant with priors and without priors. Results also indicated that the system is stable following all simulated three-phase normally cleared and stuck breaker faults. No dynamic voltage problems were noted. Therefore, estimated upgrade costs under ERIS with and without priors is $0. The estimated cost of interconnection facilities is $8.5 Million; which covers the cost of the construction of a new 161kV three-element ring bus substation at the Customer's point of interconnection.

Southwest Power Pool (SPP) has been identified as an affected system. The customer will need to satisfy the requirements deemed necessary by SPP.

Estimated ERIS Project Planning Upgrade Cost

Estimated cost With Priors*	Estimated cost Without Priors*
$0	$0

*The costs of the upgrades are planning estimates only. Detailed cost estimates and solutions will be provided in the Facilities Study.

Estimated NRIS Project Planning Upgrade Cost

Results of the System Impact Study indicated that under NRIS the upgrades listed below would be required for interconnection on Entergy's transmission system at the porposed POI.

Limiting Element	Planning Estimate for Upgrade*
Bull Shoals - Midway AECC 161kV	$7,830,000
Grimes - Mt. Zion 138kV	$15,960,000
Inland - McLewis 230kV - Supplemental Upgrade	$369,318+
LINE 558 TAP - MT. Zion 138 kV	$4,200,000
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	$55,766+

*The costs of the upgrades are planning estimates only. Detailed cost estimates, accelerated costs and solutions for the limiting elements will be provided in the Facilities Study.
+Financial payment calculation is based upon most recent construction cost estimates. The cost associated with the identified limiting element has been finalized

Energy Resource Interconnection Service

1. Introduction

This Energy Resource Interconnection Service (ERIS) is based on the Customer's request for 140.8MW interconnection on Entergy's transmission system on the proposed Grandview – Osage Creek 161kV transmission line. Grandview is a proposed substation on the Eureka Springs – Table Rock 161kV transmission line. The proposed commercial operation date of the project is December 31, 2014. The objective of this study is to assess the reliability impact of the new facility on the Entergy transmission system as well as its effects on the system's existing short circuit current capability. It is also intended to determine whether the transmission system meets standards established by NERC Reliability Standards and Entergy's planning guidelines when the plant is connected to Entergy's transmission system. If not, transmission improvements will be identified.

The System Impact Study process required a load flow analysis to determine if the existing transmission lines are adequate to handle the full output from the plant for simulated transfers to adjacent control areas. A short circuit analysis was performed to determine if the generation would cause the available fault current to surpass the fault duty of existing equipment within the Entergy transmission system.

This ERIS System Impact Study Study was based on information provided by the Customer and assumptions made by Entergy's Independent Coordinator of Transmission (ICT) planning group and Entergy's Transmission Technical System Planning group. All supplied information and assumptions are documented in this report. If the actual equipment installed is different from the supplied information or the assumptions made, the results outlined in this report are subject to change. The load flow results from the ERIS study are for information only. ERIS does not in and of itself convey any transmission service.

It was determined that there are no Entergy Transmission System upgrades required for this ERIS request. The estimated cost of interconnection facilities is $8.5 Million; which covers the cost of the construction of a new 161kV three-element ring bus substation at the Customer's point of interconnection.

2. Short circuit Analysis/Breaker Rating Analysis

2.1 Model Information

The short circuit analysis was performed on the Entergy system short circuit model using ASPEN software. This model includes all generators interconnected to the Entergy system or interconnected to an adjacent system and having an impact on this interconnection request, IPP's with signed IOAs, and approved future transmission projects on the Entergy transmission system.

2.2 Short Circuit Analysis

The method used to determine if any short circuit problems would be caused by the addition of the PID 260 generation is as follows:

> Three-phase and single-phase to ground faults were simulated on the Entergy base case short circuit model and the worst case short circuit level was determined at each station. The PID 260 generator was then modeled in the base case to generate a revised short circuit model. The base case short circuit results were then compared with the results from the revised model to identify any breakers that were under-rated as a result of additional short circuit contribution from PID 260 generation. Any breakers identified to be upgraded through this comparison are mandatory upgrades.

2.3 Analysis Results

The results of the short circuit analysis indicated that the additional generation due to PID 260 generation caused no increase in short circuit current such that they exceeded the fault interrupting capability of the high voltage circuit breakers within the vicinity of the PID 260 plant **with and without priors**. Priors included are: 221, 231, 238, 240, 244, 247, 250, 255, 256, and 257.

2.4 Problem Resolution

As a result of the short circuit analysis findings, no resolution was required.

3. Load Flow Analysis

3.1 Model Information

The load flow analysis was performed based on the projected 2015 summer peak load flow model. Approved future transmission projects in the 2011-2013 ICT Base Plan were used in the models for scenarios three and four. These upgrades can be found on Entergy's OASIS.

The loads were scaled based on the forecasted loads for the year. All firm power transactions between Entergy and its neighboring control areas were modeled for the year 2015 excluding short-term firm transactions on the same transmission interface. An economic dispatch was carried out on Entergy generating units after the scaling of load and modeling of transactions. The PID 260 generation interconnection point was modeled on the proposed Grandview–Osage Creek 161kV transmission line. Grandview is a proposed substation on the Eureka Springs–Table Rock 161kV transmission line. These associated facilities were then modeled in the case to build a revised case for the load flow analysis. Transfers were simulated between thirteen (13) control areas and Entergy using the requesting generator as the source and adjacent control area as sink.

This study considered the following four scenarios:

Scenario No.	Approved Future Transmission Projects	Pending Transmission Service & Study Requests
1	Not Included	Not Included
2	Not Included	Included
3	Included	Not Included
4	Included	Included

The generator step-up transformers, generators, and interconnecting lines were modeled according to the information provided by the customer.

3.2 Load Flow Analysis

3.2.1 Load Flow Analysis:

The load flow analysis was performed as a DC analysis using PSS/E and PSS/MUST software by Power Technologies Incorporated (PTI). A Transmission Reliability Margin (TRM) value that effectively reduced line ratings by 5% was used in the model.

With the above assumptions implemented, the First Contingency Incremental Transfer Capability (FCITC) values are calculated. The FCITC depends on various factors – the system load, generation dispatch, scheduled maintenance of equipment, and the configuration of the interconnected system and the power flows in effect among the interconnected systems. The FCITC is also dependent on previously confirmed firm reservations on the interface. The details of each scenario list each limiting element, the contingency for the limiting element, and the Available Transfer Capacity (ATC). The ATC is equal to the FCITC.

3.2.2 Performance Criteria

The criteria for overload violations are as follows:

A) With All Lines in Service

- The MVA flow in any branch should not exceed Rate A (normal rating).
- Voltage should be greater than 0.95pu.

B) Under Contingencies

- The MVA flow through any facility should not exceed Rate A.
- Voltage should be greater than 0.92pu.

3.2.3 Power Factor Consideration / Criteria

FERC Order 661A describes the power factor design requirements for wind and solar generation plants. A wind or solar generation facility's reactive power requirements are based on the aggregate of all units that feed into a single point on the transmission system. The Transmission Provider's System Impact Study is needed to demonstrate that a specific power factor requirement is necessary to ensure safety or reliability.

This facility needs to operate at unity power factor or in voltage control mode to satisfy power factor design requirements.

3.3 Analysis Results

It was determined there are no Entergy Transmission System upgrades required for this ERIS request. Summary of the analysis results are documented in Table 3.3.1 for each scenario. Detailed results for each of the thirteen (13) studied interfaces for Scenarios 1, 2, 3, and 4 are included in Appendix E.

Table 3.3.1: Summary of Results for PID 260 – ERIS Load Flow Study

Interface		Summer Peak Case Used	FCITC Available for Scenario 1	FCITC Available for Scenario 2	FCITC Available for Scenario 3	FCITC Available for Scenario 4
AECI	Associated Electric Cooperative, Inc.	2015	141	141	141	122
AEPW	American Electric Power West	2015	-1853	-1268	-1721	-1133
AMRN	Ameren Transmission	2015	-1878	-4403	-1407	-3917
CLEC	CLECO	2015	-2082	-4881	-1477	-4114
EES	Entergy	2015	-888	-2082	-678	-1890
EMDE	Empire District Electric Co	2015	141	141	141	141
LAFA	Lafayette Utilities System	2015	-708	-1660	-510	-1420
LAGN	Louisiana Generating, LLC	2015	-731	-1714	-547	-1523
LEPA	Louisiana Energy & Power Authority	2015	-989	-1074	-338	-942

Interface		Summer Peak Case Used	FCITC Available for Scenario 1	FCITC Available for Scenario 2	FCITC Available for Scenario 3	FCITC Available for Scenario 4
OKGE	Oklahoma Gas & Electric Company	2015	141	141	141	141
SMEPA	South Mississippi Electric Power Assoc.	2015	-1463	-1240	-279	-776
SOCO	Southern Company	2015	-616	-1444	-460	-1282
SPA	Southwest Power Administration	2015	141	141	141	141
TVA	Tennessee Valley Authority	2015	-869	-2038	-650	-1811

Network Resource Interconnection Service

4. Introduction

A Network Resource Interconnection Services (NRIS) study was requested to serve 140.8MW of Entergy network load. The expected in service date for this NRIS generator is December 31, 2014. The tests were performed with only confirmed transmission reservations and existing network generators and with transmission service requests in study mode.

Two tests were performed, a deliverability to generation test and a deliverability to load test. The deliverability to generation (DFAX) test ensures that the addition of this generator will not impair the deliverability of existing network resources and units already designated as NRIS while serving network load. The deliverability to load test determines if the tested generator will reduce the import capability level to certain load pockets (Amite South, WOTAB and Western Region) on the Entergy system. A more detailed description for these two tests is described in Appendix J.

It is understood that the NRIS status provides the Interconnection Customer with the capability to deliver the output of the Generating Facility into the Transmission System. NRIS in and of itself does not convey any right to deliver electricity to any specific customer or Point of Delivery

5. Analysis

5.1 Models

The models used for this analysis are the 2014-2019 summer and winter peak cases developed in 2010.

The following modifications were made to the base cases to reflect the latest information available:

- Non-firm IPPs within the local region of the study generator were turned off and other non-firm IPPs outside the local area were increased to make up the difference.
- Confirmed firm transmission reservations were modeled for the years 2014-2019.
- Approved transmission reliability upgrades for 2011-2013 were included in the base case. These upgrades can be found at Entergy's OASIS web page under approved future projects. Reference Appendix D.

5.2 Contingencies and Monitored Elements

Single contingency analyses on Entergy's transmission facilities (including tie lines) 115kV and above were considered. All transmission facilities on Entergy transmission system above 100kV were monitored.

6. Generation used for the transfer

The Customer's generators were used as the source for the deliverability to generation test.

7. Results

7.1 Deliverability to Generation (DFAX) Test

The deliverability to generation (DFAX) test ensures that the addition of this generator will not impair the deliverability of existing network resources and units already designated as NRIS while serving network load. A more detailed description for these two tests is described in Appendix J.

7.2 Constraints

Study Case	Study Case with Priors
	Ameila Bulk - Bevil 230kV
Bevil - Cypress 230kV	Bevil - Cypress 230kV
Bull Shoals - Midway AECC 161kV	Bull Shoals - Midway AECC 161kV
	Cypress 500/138kV transformer 1
Grimes - Grimes 345/138kV transformer 1	Grimes - Grimes 345/138kV transformer 1
Grimes - Grimes 345/138kV transformer 2	Grimes - Grimes 345/138kV transformer 2
Grimes - Mt. Zion 138kV	Grimes - Mt. Zion 138kV
Hartburg - Inland Orange 230kV - Supplemental Upgrade	Hartburg - Inland Orange 230kV - Supplemental Upgrade
Helbig - McLewis 230kV	Helbig - McLewis 230kV
Inland - McLewis 230kV - Supplemental Upgrade	Inland - McLewis 230kV - Supplemental Upgrade
LINE 558 TAP - MT. Zion 138 kV	LINE 558 TAP - MT. Zion 138 kV
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade

7.3 DFAX Study Case Results

Year	Limiting Element	Contingency Element	ATC (MW)
12/31/14 – 12/31/19	Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-2493
	Hartburg - Inland Orange 230kV - Supplemental Upgrade	Cypress - Hartburg 500kV	-1041
	Grimes - Mt. Zion 138kV	Grimes - Bentwater 138kV	-594
	Inland - McLewis 230kV - Supplemental Upgrade	Cypress - Hartburg 500kV	-503
	Grimes - Mt. Zion 138kV	Bentwater - Walden 138kV	-365
	Grimes - Grimes 345/138kV transformer 2	Grimes - Grimes 345/138kV transformer 1	-236
	Grimes - Grimes 345/138kV transformer 1	Grimes - Grimes 345/138kV transformer 2	-236
	Helbig - McLewis 230kV	Cypress - Hartburg 500kV	-197
	Bevil - Cypress 230kV	Hartburg 500/230kV transformer 1	-119
	Bevil - Cypress 230kV	Hartburg - Inland Orange 230kV	-113
	LINE 558 TAP - MT. Zion 138 kV	Grimes - Bentwater 138kV	-71
	Grimes - Mt. Zion 138kV	Walden - April 138kV	-61
	Grimes - Mt. Zion 138kV	Hartburg - Mount Olive 500kV	85
	Grimes - Mt. Zion 138kV	April - Lake Forest 138kV	115
	Bull Shoals - Midway AECC 161kV	Independence SES - Moorefield 161kV	129

7.4 DFAX Study Case with Priors Results

Year	Limiting Element	Contingency Element	ATC (MW)
12/31/14 – 12/31/19	Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-3673
	Hartburg - Inland Orange 230kV - Supplemental Upgrade	Cypress - Hartburg 500kV	-1657
	Inland - McLewis 230kV - Supplemental Upgrade	Cypress - Hartburg 500kV	-1134
	Grimes - Mt. Zion 138kV	Grimes - Bentwater 138kV	-919
	Helbig - McLewis 230kV	Cypress - Hartburg 500kV	-836
	Grimes - Mt. Zion 138kV	Bentwater - Walden 138kV	-694
	Bevil - Cypress 230kV	Hartburg 500/230kV transformer 1	-682
	Bevil - Cypress 230kV	Hartburg - Inland Orange 230kV	-676
	Grimes - Grimes 345/138kV transformer 2	Grimes - Grimes 345/138kV transformer 1	-552
	Grimes - Grimes 345/138kV transformer 1	Grimes - Grimes 345/138kV transformer 2	-552
	LINE 558 TAP - MT. Zion 138 kV	Grimes - Bentwater 138kV	-404
	Grimes - Mt. Zion 138kV	Walden - April 138kV	-394
	Bevil - Cypress 230kV	Inland - McLewis 230kV	-363
	Ameila Bulk - Bevil 230kV	Hartburg 500/230kV transformer 1	-290
	Ameila Bulk - Bevil 230kV	Hartburg - Inland Orange 230kV	-285
	Grimes - Mt. Zion 138kV	April - Lake Forest 138kV	-220
	Bevil - Cypress 230kV	Helbig - McLewis 230kV	-188
	LINE 558 TAP - MT. Zion 138 kV	Bentwater - Walden 138kV	-168
	Grimes - Mt. Zion 138kV	Lake Forrest - Woodhaven 138kV	-144
	Cypress 500/138kV transformer 1	Cypress 500/230kV transformer	-113
	Bull Shoals - Midway AECC 161kV	Independence SES - Moorefield 161kV	-102
	Grimes - Mt. Zion 138kV	Conroe Bulk - Woodhaven 138kV	-25
	Grimes - Mt. Zion 138kV	Hartburg - Mount Olive 500kV	37
	Ameila Bulk - Bevil 230kV	Inland - McLewis 230kV	40
	Bull Shoals - Midway AECC 161kV	Batesville - Moorefield 161kV	66

7.5 Deliverability to Load Test

The deliverability to load test determines if the tested generator will reduce the import capability level to certain load pockets (Amite South, WOTAB and Western Region) on the Entergy system. A more detailed description for these two tests is described in Appendix J.

A. Amite South: Passed

B. WOTAB: Passed

C. Western Region: Passed

8. Required Upgrades for NRIS

8.1 Preliminary Estimates of Direct Assignment of Facilities and Network Upgrades

Limiting Element	Planning Estimate for Upgrade*
Bull Shoals - Midway AECC 161kV	$7,830,000
Grimes - Mt. Zion 138kV	$15,960,000
Inland - McLewis 230kV - Supplemental Upgrade	$369,318+
LINE 558 TAP - MT. Zion 138 kV	$4,200,000
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	$55,766+

*The costs of the upgrades are planning estimates only. Detailed cost estimates, accelerated costs and solutions for the limiting elements will be provided in the facilities study.
+Financial Payment calculation is based upon most recent construction cost estimates. The cost associated with the identified limiting element has been finalized

9. Facilities at the Point of Interconnection

The Interconnection Customer's designated Point of Interconnection (POI) is a new 161kV substation that will be constructed and cut-in on Entergy's proposed Grandview–Osage Creek 161kV transmission line. The interconnection customer is responsible for constructing all facilities needed to deliver generation to the POI. The estimated cost for a 161kV three-element ring bus configuration substation is $8.5 Million. This cost is based on parametric estimating techniques for a "typical" site. Cost may significantly change based on specific project parameters that are not known at this time. Costs specific to this interconnection will be developed during the Facilities Study.

Stability Study

10. Executive Summary

Southwest Power Pool (SPP) commissioned ABB Inc. to perform a System Impact Study for PID 260, which is a request for the interconnection of 140.8 MW of wind power generation connected midway on the Grandview-Osage Creek 161kV line through a three-breaker ring bus in the Entergy System. The feasibility (power flow) study was not performed as a part of this study.

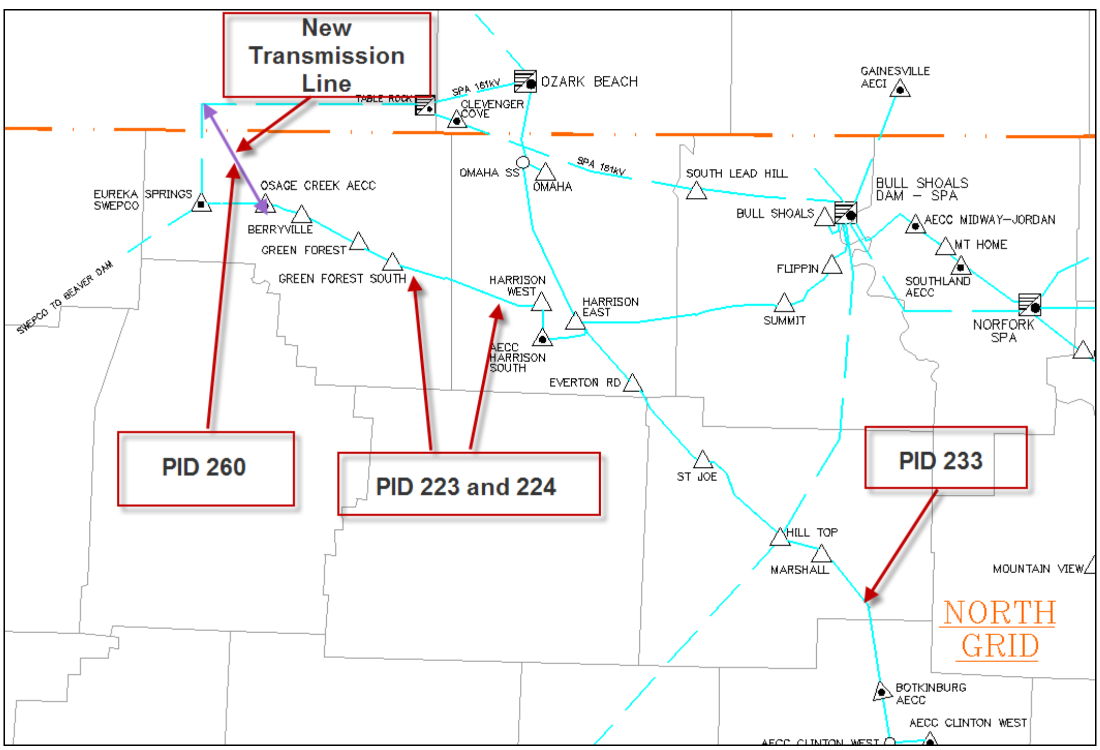
The objective of this study was to evaluate the impact of the proposed wind farm on system stability. The study was performed on 2015 Summer Peak case, provided by SPP/Entergy.

The system was stable following all simulated normally cleared three-phase faults. However, results showed that the Ozark Beach generating units in the study area became unstable following a three-phase stuck breaker fault. See Fault 6a in Section 2.3 of this report. Further investigation on a pre-project case (without PID 260) showed similar results. Hence, it was concluded that the instability is not attributable to PID 260. Additional analysis was performed by repeating Fault 6a on the post-project case and simulating a single-line-to-ground stuck-breaker fault (instead of a three-phase stuck breaker fault). No instabilities were observed. Also, no voltage criteria violations were observed following the simulated faults.

The proposed project (PID 260) complies with the latest FERC order on low voltage ride through for wind farms. Results show that the proposed wind farm does not trip off line by voltage relay actuation for local faults at the POI.

Based on the results of stability analysis it can be concluded that the proposed PID 260 wind farm **does not** adversely impact the stability of the Entergy System.

Figure 10.1: PID 260 Point of Interconnection



11. Final conclusions

Based on the results of stability analysis it can be concluded that proposed PID 260 wind farm **does not** adversely impact the stability of the Entergy System in the local area. The system was stable following all simulated normally cleared three-phase faults. However, results showed that the Ozark Beach generating units in the study area became unstable following a three-phase stuck-breaker fault. See Fault 6a in Section 12.3 of this report. Further investigation on a pre-project case (without PID 260) showed similar results. Hence, it was concluded that the instability is not attributable to PID 260. Additional analysis was performed by repeating Fault 6a on the post-project case and simulating a single-line-to-ground stuck-breaker fault (instead of a three-phase stuck breaker fault). No instabilities were observed. No voltage criteria violations were observed following the simulated faults.

The proposed project (PID 260) complies with FERC Order 661A on low voltage ride through for wind farms. Results show that the proposed wind farm does not trip off line by voltage relay actuation for local faults at the POI.

12. Stability Analysis

12.1 Stability Analysis Methodology

Stability analysis was performed using Siemens-PTI's PSS/E™ dynamics program V30.3.3. Three-phase and single-phase line faults were simulated for the specified duration and synchronous machine rotor angles and wind turbine generator speeds were monitored to check whether synchronism is maintained following fault removal. In addition, voltages were monitored on selected buses in the study area to check for voltage criteria violations (see below).

Entergy has evaluation criteria for the transient voltage dip as follows:

- Three-phase fault or single-line-ground fault with normal clearing resulting in the loss of a single component (generator, transmission circuit or transformer) or a loss of a single component without fault:
    - Not to exceed 20% for more than 20 cycles at any bus
    - Not to exceed 25% at any load bus
    - Not to exceed 30% at any non-load bus
- Three-phase faults with normal clearing resulting in the loss of two or more components (generator, transmission circuit or transformer), and SLG fault with delayed clearing resulting in the loss of one or more components:
    - Not to exceed 20% for more than 40 cycles at any bus
    - Not to exceed 30% at any bus

The duration of the transient voltage dip excludes the duration of the fault. The transient voltage dip criteria will not be applied to three-phase faults followed by stuck-breaker conditions unless the determined impact is extremely widespread. The voltages at all local buses (161 kV) were monitored during each of the fault cases as appropriate. As there is no specific voltage dip criteria for three-phase stuck-breaker faults, the results of these faults were compared with the most stringent voltage dip criteria of - not to exceed 20% for more than 20 cycles.

12.2 Study Model Development

The PID 260 project is a 140.8 MW wind farm, which is comprised of 88 GE 1.6 MW wind turbine-generators. These wind turbine-generators are connected via cables, generator step-up transformers, and other balance-of-system components necessary to convert wind energy to AC power for delivery at transmission or distribution voltage.

The PID 260 wind generation is modeled as an equivalent generator, which is scaled to the capacity rating of proposed wind farm (140.8 MW). The voltage at the wind turbine terminal is 690 V and is stepped up to feed a 34.5kV collector system through generator step-up transformer, which is connected to the point of interconnection of PID 260 via 34.5/161kV station transformer and a 161kV transmission line.

Based on the provided data, the wind machine is capable of supplying/drawing reactive power to/from the grid thus contributing to grid voltage support. The WTG reactive power capability corresponds to a power factor range from 0.9 lagging to 0.9 leading. The data for the proposed wind power generation is included in Appendix A.

The study model consists of a power flow case and a dynamics database, developed as follows.

12.2.1 Power Flow Case

A powerflow case “EN15S10_U2_CP_final_unconv.sav” representing 2015 Summer Peak conditions was provided by SPP/ Entergy.

Two (2) prior-queued projects, PID 223 and PID 224 of 125 MW and 100 MW rating respectively, were added to the base case by tapping the Green Forest – Harrison West 161kV line. In addition, the representation of the Table Rock 161/69kV three-winding transformers was updated in accordance with data provided by SPP. In this manner, a pre-project powerflow case was established and named as ‘PRE-PID-260.SAV’

The proposed PID 260 project is connected on a tap on the 161kV line between Grandview and Osage Creek substations. The additional 140.8 MW was dispatched against the system swing bus. The wind generator is modeled in voltage control mode controlling the 34.5kV collector bus voltage (#99960) to 1.00 p.u. Thus, a post-project power flow case with PID 260 was established and named as ‘POST-PID-260.SAV’.

Figure 12.1 and Figure 12.2 show the PSS/E one-line diagrams for the local area WITHOUT and WITH the PID 260 project, respectively, for 2015 Summer Peak system conditions.

12.2.2 Stability Database

A basecase stability database was provided by SPP/Entergy in a PSSE *.dyr file format (red16S_newnum.dyr).

To create a dynamic database (a snapshot file) for Pre-PID 260 powerflow case, stability data for PID 223 and PID 224 was appended to the basecase stability database. Then, the stability data for PID 260 was appended to the pre-project stability database to create dynamic database for Post-PID 260 powerflow case.

The data provided for the Interconnection Request for PID 260 is included in Appendix A. The PSS/E power flow and stability data for PID 260, used for this study, are included in Appendix A.

Figure 12.1: 2015 Summer Peak Flows and Voltages without PID 260

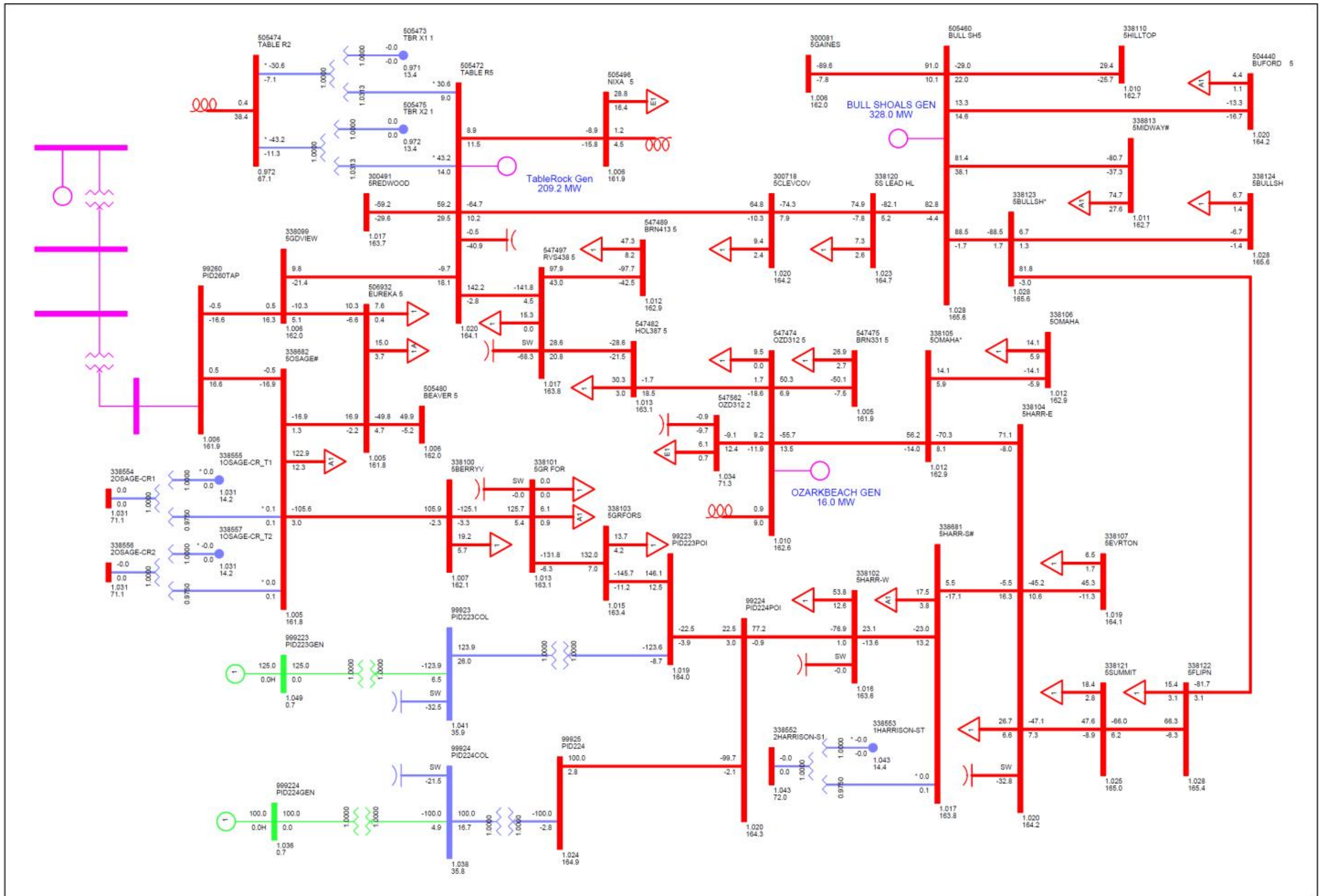


Diagram created using 'PRE-PID-260.SAV' 'SLD - modcase.sld'	PRE-PID260 CASE TUE, NOV 15 2011 13:27	Bus - VOLTAGE (KV/PU) Branch - MW/MVAR Equipment - MW/MVAR KV: <=0.700 <=35.000 <=162.000 >162.000

Figure 12.2: 2012 Summer Peak Flows and Voltages with PID 260

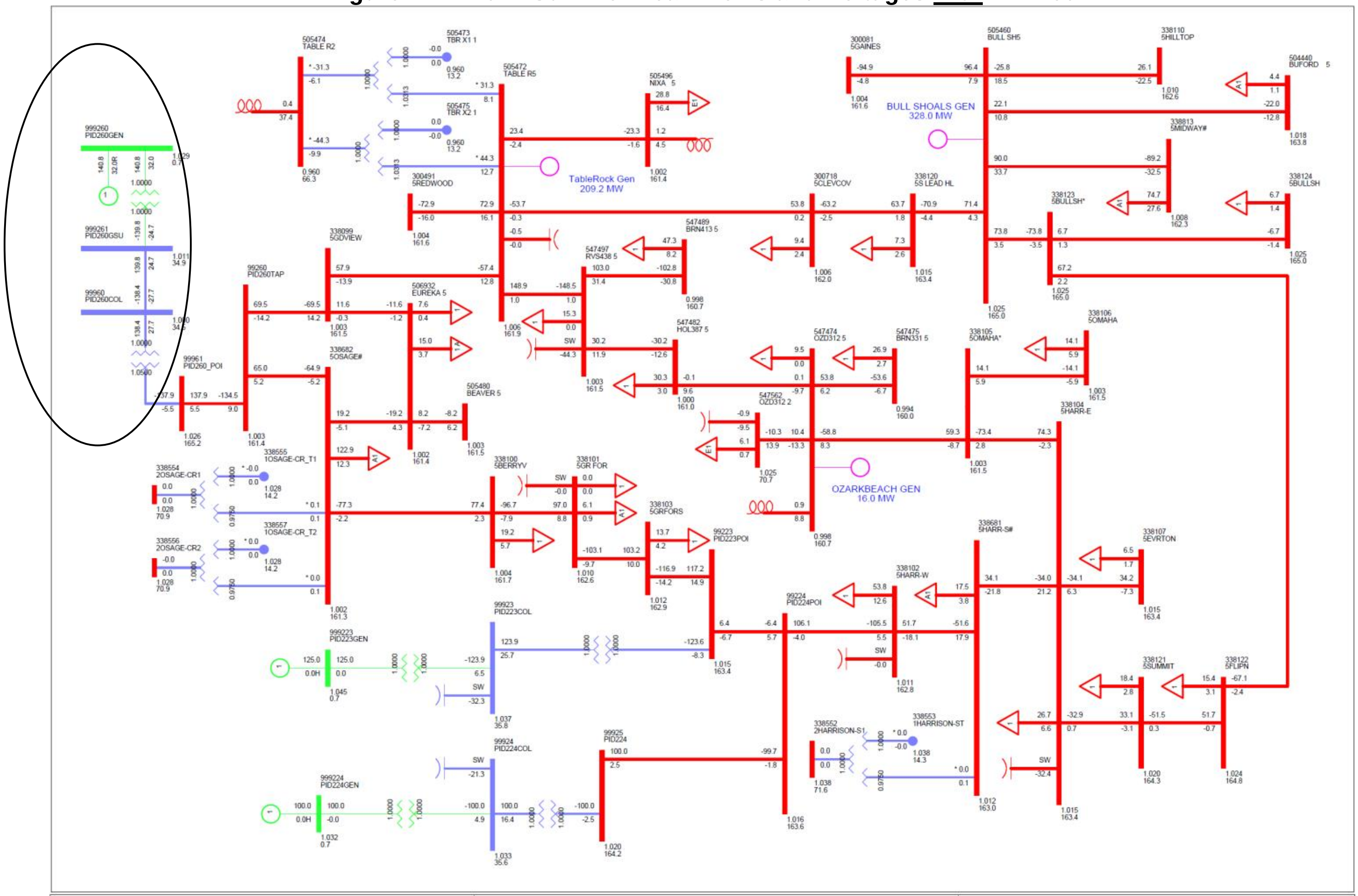


Diagram created using 'POST-PID-260.SAV' 'SLD - modcase.sld'	POST-PID260 CASE TUE, NOV 15 2011 13:58	Bus - VOLTAGE (KV/PU) Branch - MW/MVAR Equipment - MW/MVAR KV: <=0.700 <=35.000 <=162.000 >162.000

12.3 TRANSIENT STABILITY ANALYSIS

Stability simulations were run to examine the transient behavior of the PID 260 generation and its impact on the Entergy system. Stability analysis was performed using the following procedure. First, three-phase faults with normal clearing were simulated. Next, three-phase stuck-breaker faults were simulated. The fault clearing times used for the simulations are given inTable 12.1.

Table12.1: Fault Clearing Times

Contingency at kV level	Normal Clearing	Delayed Clearing
161	6 cycles	6+9 cycles

The breaker failure scenario was simulated with the following sequence of events:

1) At the normal clearing time for the primary breakers, the faulted line is tripped at the far end from the fault by normal breaker opening.

2) The fault remains in place for three-phase stuck-breakers.

3) The fault is then cleared by back-up clearing. If the system was found to be unstable, then the fault was repeated without the proposed PID 260 project.

All line trips are assumed to be permanent (i.e., no high speed re-closure).

Table 12.2 lists all the fault cases that were simulated in this study. Fifteen (15) three-phase normally cleared and nine (9) three-phase stuck-breaker faults (following group Pole Operation of breakers) were simulated.

For all cases analyzed, the initial disturbance was applied at t = 0.1 seconds. The breaker clearing was applied at the appropriate time following this fault inception.

Table 12.2: List of faults simulated for stability analysis

Fault #	Line on which Fault occurs	Fault Location (For Simulation)	Fault Type	Fault Clearing (cycles)		Stuck-breaker	Breaker Clearing		Tripped Facilities
				Primary	Back-up		Primary	Back-up	
Fault_1	PID 260 TAP - Grandview 161 kV	PID 260 TAP 161 kV	3 PH	6	None	None	PID260 TAP	None	PID 260 TAP - Grandview 161 kV
Fault_2	PID 260 TAP – Osage Creek 161 kV	PID 260 TAP 161 kV	3 PH	6	None	None	PID260 TAP	None	PID 260 TAP – Osage Creek 161 kV
Fault_3	Osage Creek - EurekaSprings 161 kV	Osage Creek 161 kV	3 PH	6	None	None	B7245 (Osage Creek) 1H60 (Eureka Spr.)	None	Osage Creek – Eureka Springs 161 kV
Fault_4	Osage Creek-Berryville 161 kV	Osage Creek 161 kV	3 PH	6	None	None	B 5585 (Osage Creek) PID223 POI	None	OsageCreek-PID223 POI 161 kV
Fault_5	Grandview - Eureka Springs 161 kV	Grandview 161 kV	3 PH	6	None	None	B 12 &B 22 (Grandview) 1H50 (Eureka Spr.)	None	Grandview - Eureka Springs 161 kV
Fault_6	Table Rock - Riverside 161 kV	Table Rock 161 kV	3 PH	6	None	None	32 (Table Rock)	None	Table Rock - Riverside 161 kV
Fault_7	Table Rock - Redwood 161 kV	Table Rock 161 kV	3 PH	6	None	None	Breakers on Redwood outgoing	None	Table Rock - Redwood 161 kV
Fault_8	Eureka Springs-Beaver 161 kV	Eureka Springs 161 kV	3 PH	6	None	None	1H50, 1H60 (Eureka Spr.) 32,42 (Beaver Dam)	None	Eureka Springs-Beaver 161 kV Eureka Springs- Grandview 161 kV Eureka Springs- Osage Creek 161 kV
Fault_9	Bull Shoals Dam- Midway 161 kV	Bull Shoals Dam 161 kV	3 PH	6	None	None	82 (Bulls Shoals Dam) Breaker at Midway	None	Bull Shoals Dam- Midway 161 kV
Fault_10	Bull Shoals Dam – Gainesville 161 kV	Bull Shoals Dam 161 kV	3 PH	6	None	None	22 (Bulls Shoals Dam), Breaker at	None	Bull Shoals Dam- Gaines Ville 161 kV

Fault #	Line on which Fault occurs	Fault Location (For Simulation)	Fault Type	Fault Clearing (cycles)		Stuck-breaker	Breaker Clearing		Tripped Facilities
				Primary	Back-up		Primary	Back-up	
							Gainesville		
Fault_11	Bull Shoals Dam-Lead hill 161 kV	Bull Shoals Dam 161 kV	3 PH	6	None	None	102 (Bulls Shoals Dam), Breaker at Lead hill	None	Bull Shoals Dam-Lead hill 161 kV
Fault_12	Harrison East - Everton 161 kV	Harrison East 161 kV	3 PH	6	None	None	B4836 (Harrison East) B 2965, B 2985 (Hill Top)	None	Harrison East - Everton 161 kV Everton-St. Joe 161 kV St Joe – Hill Top 161 kV
Fault_13	Harrison East-Summit 161 kV	Harrison East 161 kV	3 PH	6	None	None	B6236 (Harrison East) OCB#62 (Bull Shoals Dam)	None	Harrison East-Summit 161 kV Summit – Flipin 161 kV Flipin – Bull Shoals Dam 161 kV
Fault_14	Harrison East - Omaha161 kV	Harrison East 161 kV	3 PH	6	None	None	B 1636 (Harrison East) OCB#16106 (Ozark Beach)	None	Harrison East - Omaha161 kV Omaha – Ozark Beach 161 kV
FAULT_15	PID224POI – Harrison West 161 kV	PID224 POI 161 kV	3 PH	6	None	None	New Breaker (PID 224 POI) 5136 (Harrison East)	None	PID224POI – Harrison East 161 kV
FAULT_3a	Osage Creek - EurekaSprings 161 kV	Osage Creek 161 kV	3 PHSB	6	9	B7245 (Osage Creek)	1H60 (Eureka Spr.)	PID260 TAP B5585 (Osage Creek)	Osage Creek - EurekaSprings 161 kV Osage Creek- PID260 TAP 161 kV OsageCreek- PID223 POI 161 kV

Fault #	Line on which Fault occurs	Fault Location (For Simulation)	Fault Type	Fault Clearing (cycles)		Stuck-breaker	Breaker Clearing		Tripped Facilities
				Primary	Back-up		Primary	Back-up	
FAULT_6a	Table Rock - Riverside 161 kV	Table Rock 161 kV	3 PHSB	6	9	32 (Table Rock)	Riverside	Table Rock bus	Table Rock-Grandview 161 kV Table Rock - Redwood 161 kV Table Rock - Riverside 161 kV Table Rock – Clevenger Cove 161 kV Table Rock- Nixa 161 kV Table Rock Transformer Table Rock generation dropped
FAULT_6b	Table Rock - Riverside 161 kV	Table Rock 161 kV	1 PHSB	6	9	32 (Table Rock)	Riverside	Table Rock bus	Table Rock-Grandview 161 kV Table Rock - Redwood 161 kV Table Rock - Riverside 161 kV Table Rock – Clevenger Cove 161 kV Table Rock- Nixa 161 kV Table Rock Transformer Table Rock generation dropped
FAULT_9a	Bull Shoals Dam- Midway 161 kV	Bull Shoals Dam 161 kV	3 PHSB	6	9	Bull Shoals Dam (82)	Midway	Breaker on Gainesville, Hilltop, BSH Dam and Buford	Bull Shoals Dam- Midway 161 kV Bull Shoals Dam- Gaines Ville 161 kV Bull Shoals Dam -Hilltop 161 kV Bull Shoals Dam – Bull Shoals Dam 161 kV Bull Shoals Dam - Buford 161 KV
FAULT_12a	Harrison East - Everton 161 kV	Harrison East 161 kV	3 PHSB	6	9	B4836 (Harrison East)	B2965 B2985 (Hill Top)	B3610 B1636 B6236 B5136 (Harrison East)	Harrison East 161 kV bus
FAULT_16	Grandview - Table Rock 161 kV	Grandview 161 kV	3 PHSB	6	9	B2735 (Grandview)	B22 (Grandview)	B2755 (Grand view) PID260 TAP	Grandview - Table Rock 161 kV Grandview - PID260 tap 161 kV
FAULT_17	Grandview - Table Rock 161 kV	Grandview 161 kV	3 PHSB	6	9	B22(Grandview)	B2735 (Grandview)	B12 (Grand view)	Grandview - Table Rock 161 kV Grandview - Eureka Springs 161 kV

Fault #	Line on which Fault occurs	Fault Location (For Simulation)	Fault Type	Fault Clearing (cycles)		Stuck-breaker	Breaker Clearing		Tripped Facilities
				Primary	Back-up		Primary	Back-up	
								1H50 (Eureka Spr)	
FAULT_18	Grandview - Eureka Springs 161 kV	Grandview 161 kV	3 PHSB	6	9	B22 (Grandview)	B12 (Grandview)	B2735 (Grandview) 62 (Table Rock)	Grandview - Table Rock 161 kV Grandview - Eureka Springs 161 kV
FAULT_19	Osage Creek-Eureka Springs 161 kV	Osage Creek 161 kV	3 PHSB	6	9	B7245 (Osage Creek)	1H60 (Eureka Springs)	B5585 (Osage Creek) PID260 POI Breaker PID223 POI breaker	Osage Creek - EurekaSprings 161 kV Osage Creek - PID223 POI 161 kV Osage Creek - PID260 tap 161 kV
FAULT_20	OsageCreek-PID223 POI 161 kV	Osage Creek 161 kV	3 PHSB	6	9	B5585 (Osage Creek)	PID223 POI breaker	B7245 (Osage Creek) 1H60 (Eureka Springs) PID 260 POI Breaker	Osage Creek - EurekaSprings 161 kV Osage Creek – PID223 POI 161 kV Osage Creek - PID260 tap 161 kV
3PH = Three-phase faults									
3PHSB = Three-phase stuck-breaker faults 1PHSB = Single-phase stuck-breaker faults									
Assumed a three-breaker ring bus at the POI of PID223, PID224 and PID260									

Figure 12.3: Grandview 161kV Substation & PID 260 POI 161kV Substation

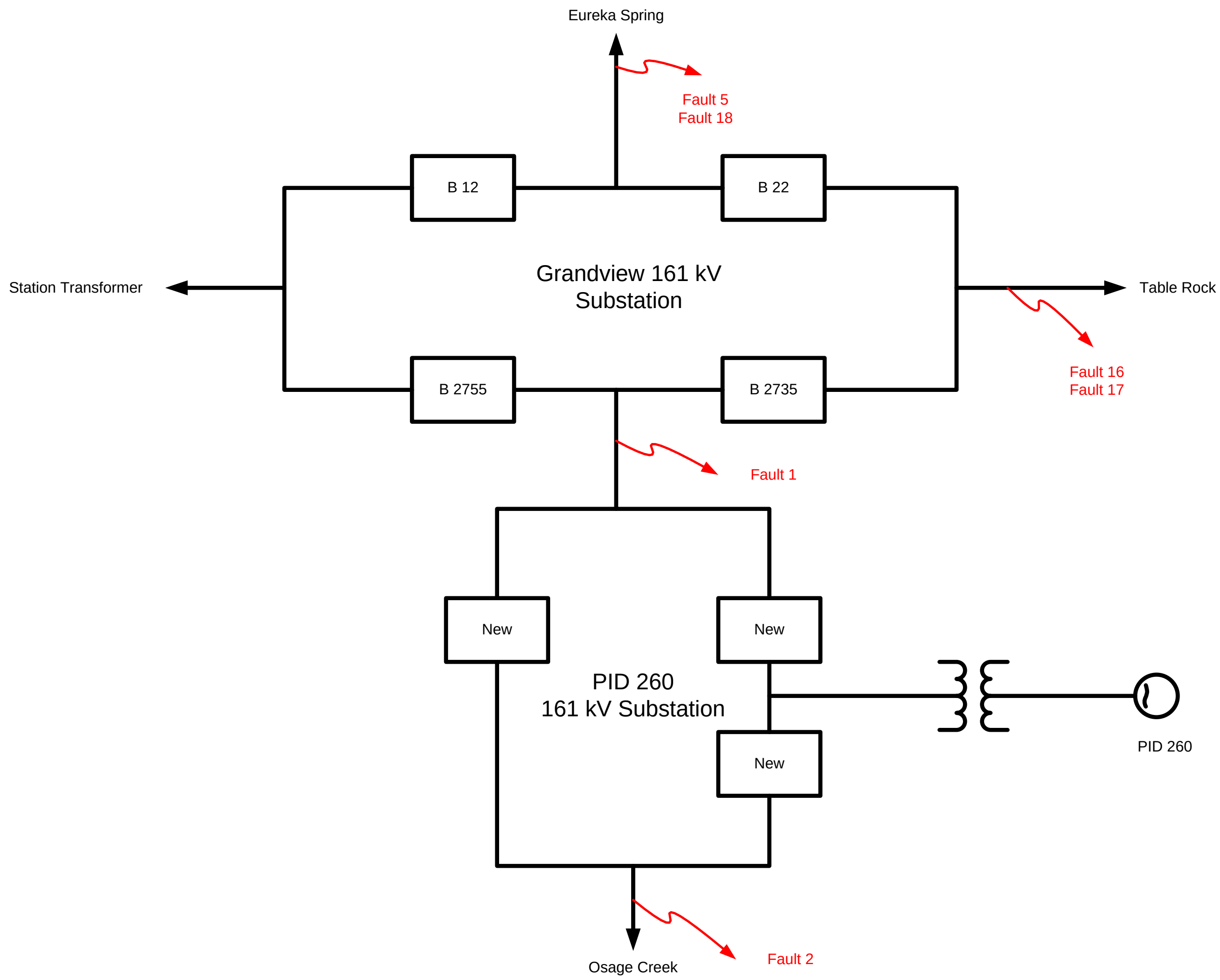


Figure 12.4: Osage Creek 161kV Substation

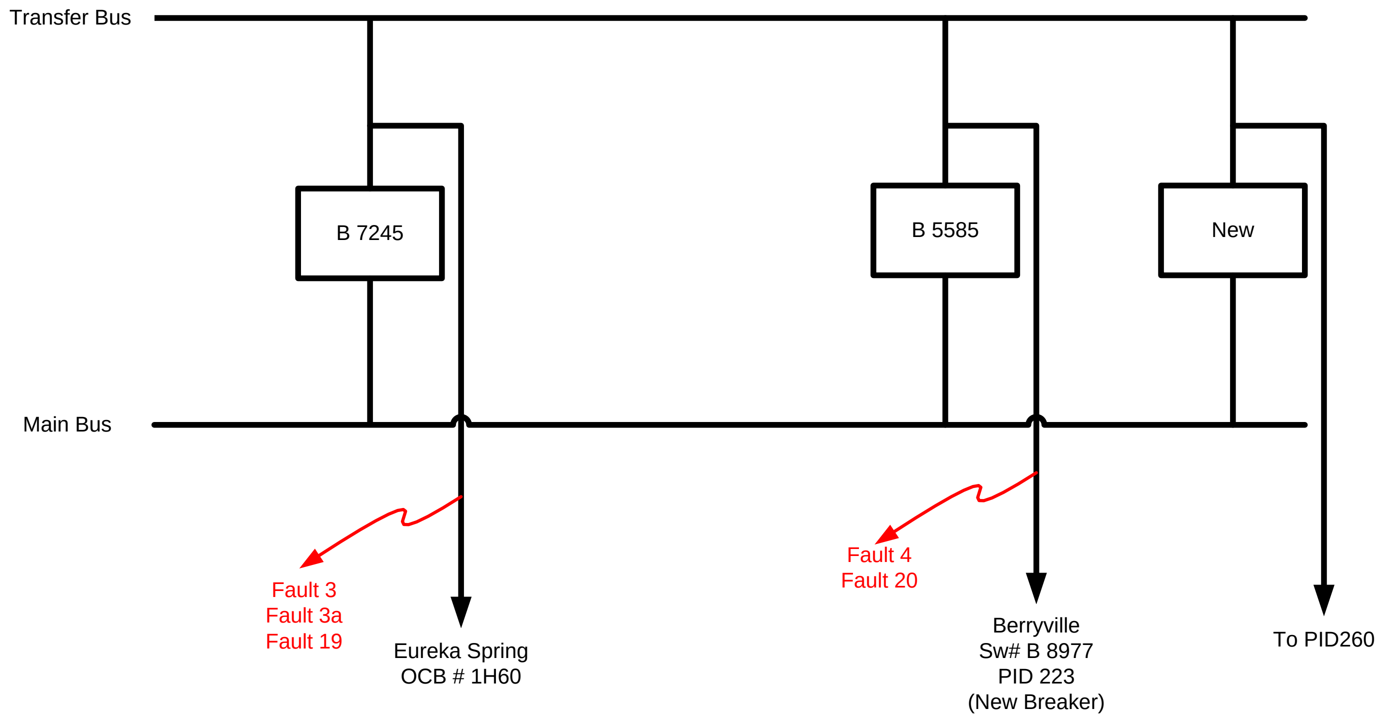


Figure 12.5: Table Rock 161kV Substation

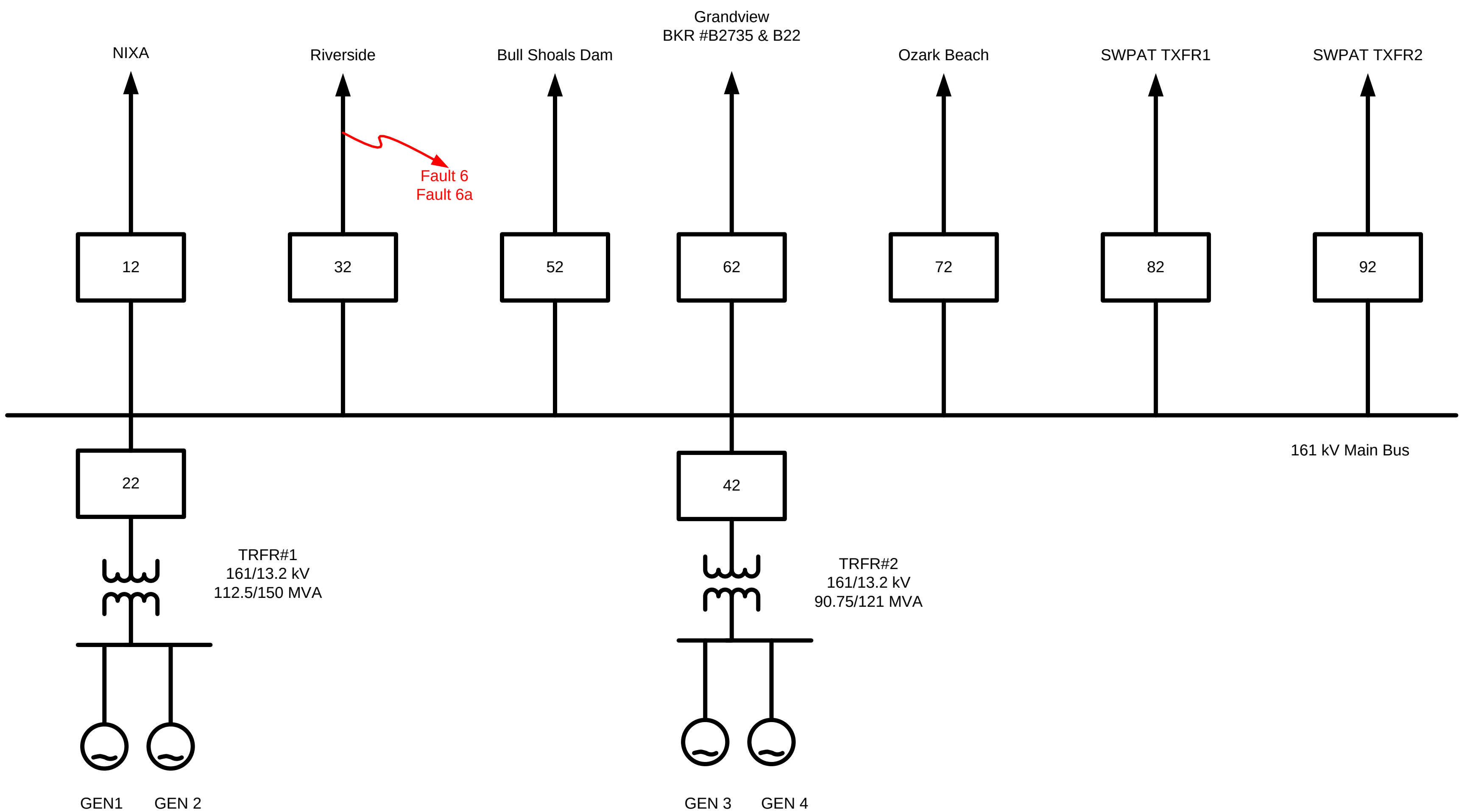


Figure 12.6 Bull Shoals Dam 161kV Substation

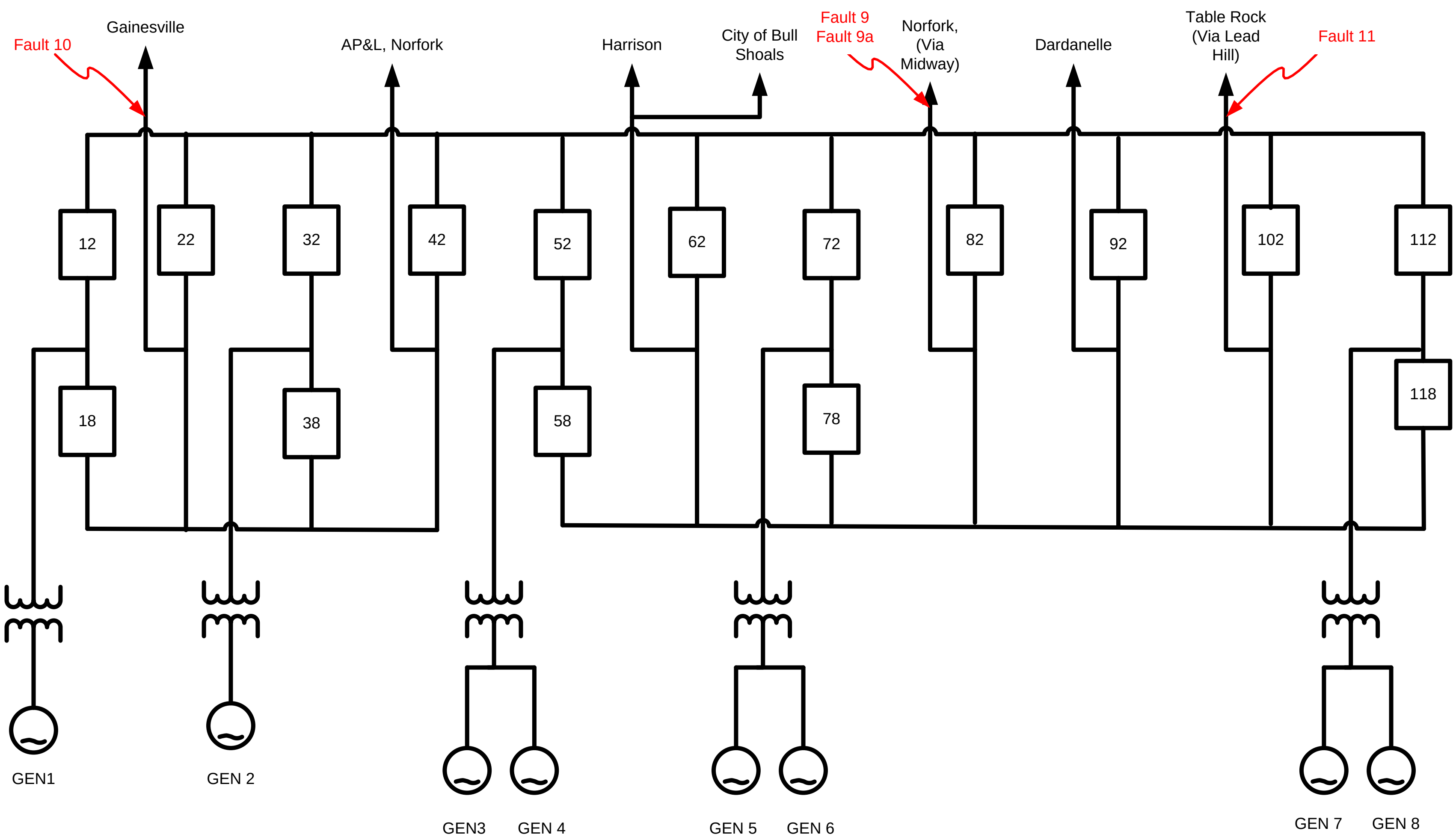


Figure 12.7: Harrison East 161kV Substation

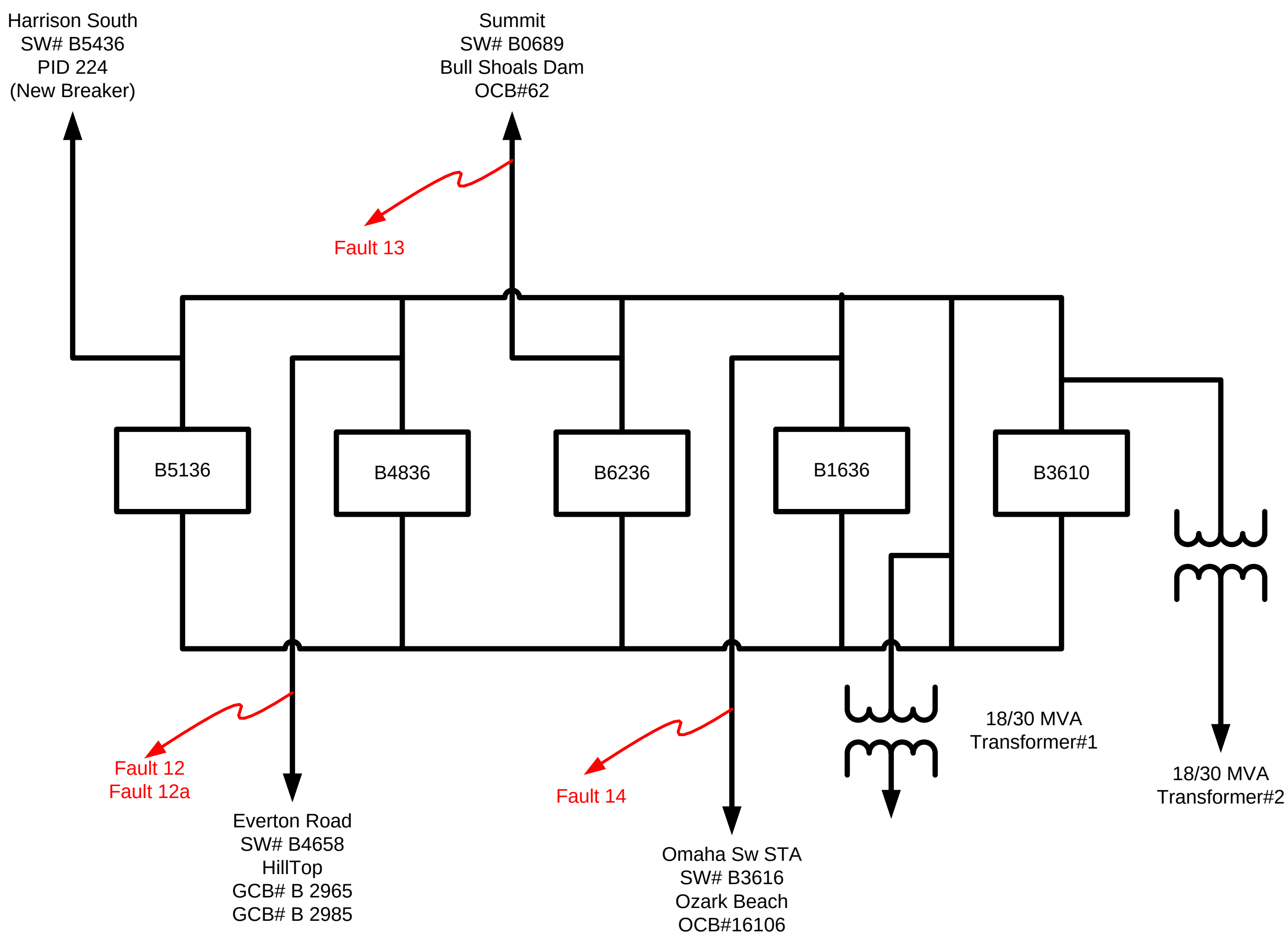


Figure 12.8: PID 224 POI 161kV Substation

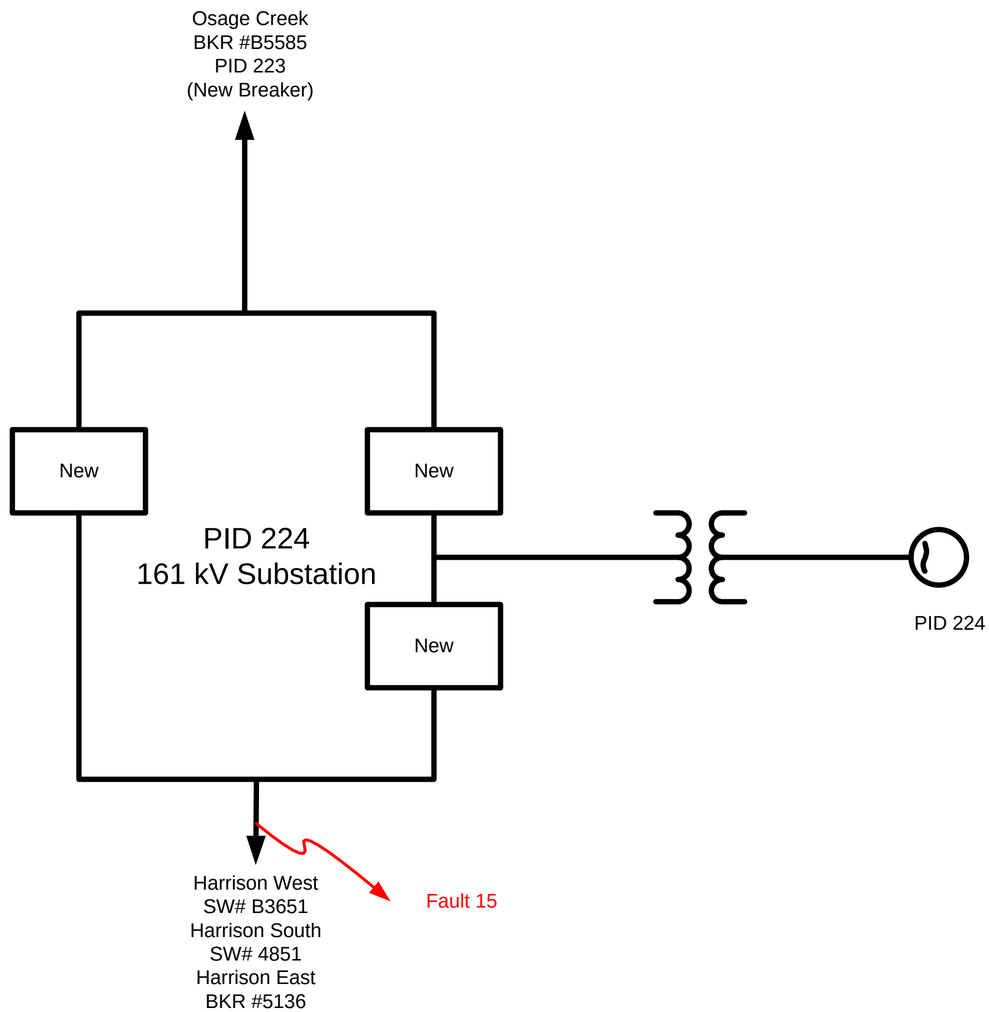
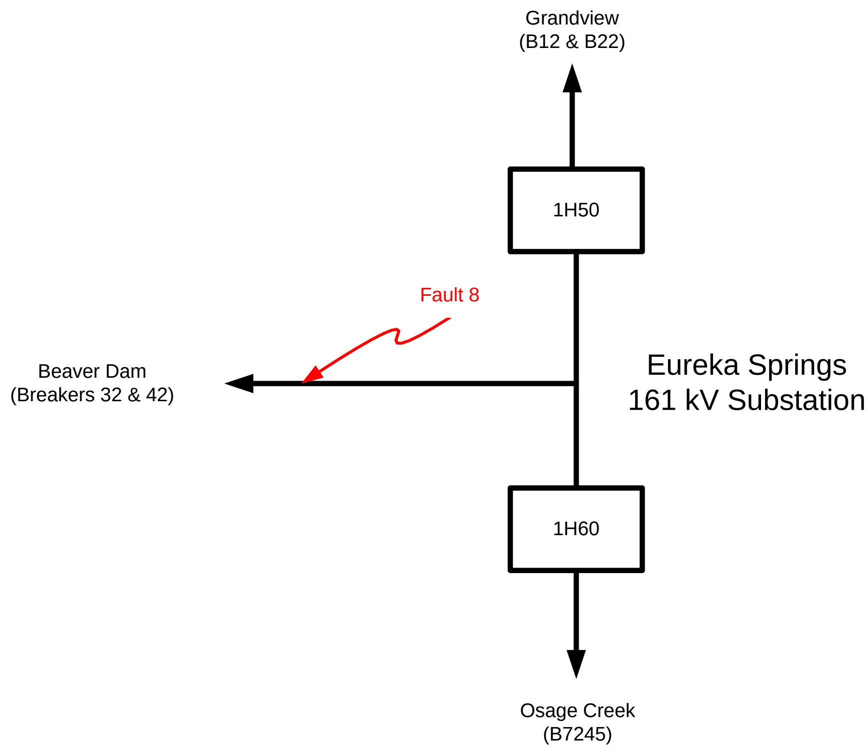


Figure 12.9: Eureka Springs 161kV



The system was found to be **STABLE** following all the simulated faults. Table 12.3 shows the simulation results for the three-phase normally cleared and stuck breaker faults and the plots for the stability simulations are included in Appendix C.

In Fault 6a, the generating units at Table Rock are islanded and tripped upon fault clearing. However, the Ozark Beach generating units became unstable. This is not surprising considering that a three-phase stuck breaker fault is a severe event. In order to check the impact of the proposed PID 260 generation on the instability, Fault 6a was repeated on the pre-PID 260 stability case. The instability of the Ozark Beach units was observed even in the pre-PID 260 condition and hence cannot be attributed to PID 260. Additional analysis was performed by repeating Fault 6a on the post-project case and simulating a single-line-to-ground stuck breaker fault (instead of a three-phase stuck breaker fault). No instabilities were observed.

In Fault 9a, the generating units at Bull Shoals Dam are islanded and tripped upon fault clearing. No instability was observed.

Firure 12.10 and Figure 12.11 show the network quantities and Figure 12.12 shows the wind turbine-generator quantities for fault_1, which is a three-phase fault at PID 260 TAP on the Grandview 161kV line.

12.3.1 Transient Voltage Recovery

No voltage criteria violations were observed following the simulated faults.

The voltages at all buses in the Entergy system (161kV) in the vicinity of the project were monitored during each of the fault cases. No voltage criteria violations were observed following normally cleared three-phase faults.

As there are no specific voltage dip criteria for three-phase stuck breaker faults, the results of these faults were compared with the most stringent voltage dip criteria of - not to exceed 20 % for more than 20 cycles. After comparison against the voltage-criteria, no faults were found to be in violation.

Figure 12.10: Local Machine Angles for FLT_1_3PH

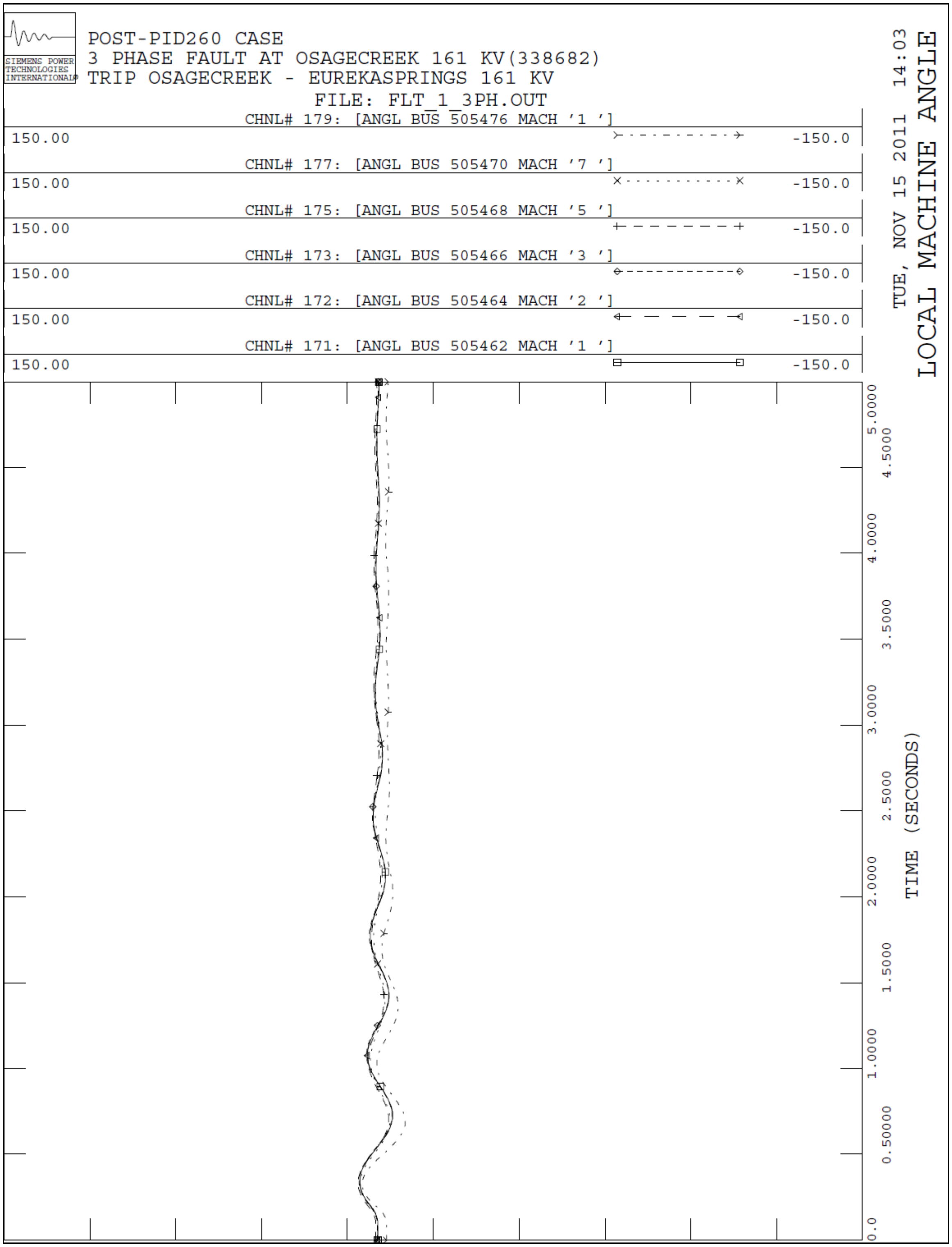


Figure 12.11: Local Bus Voltages for FLT_1_3PH

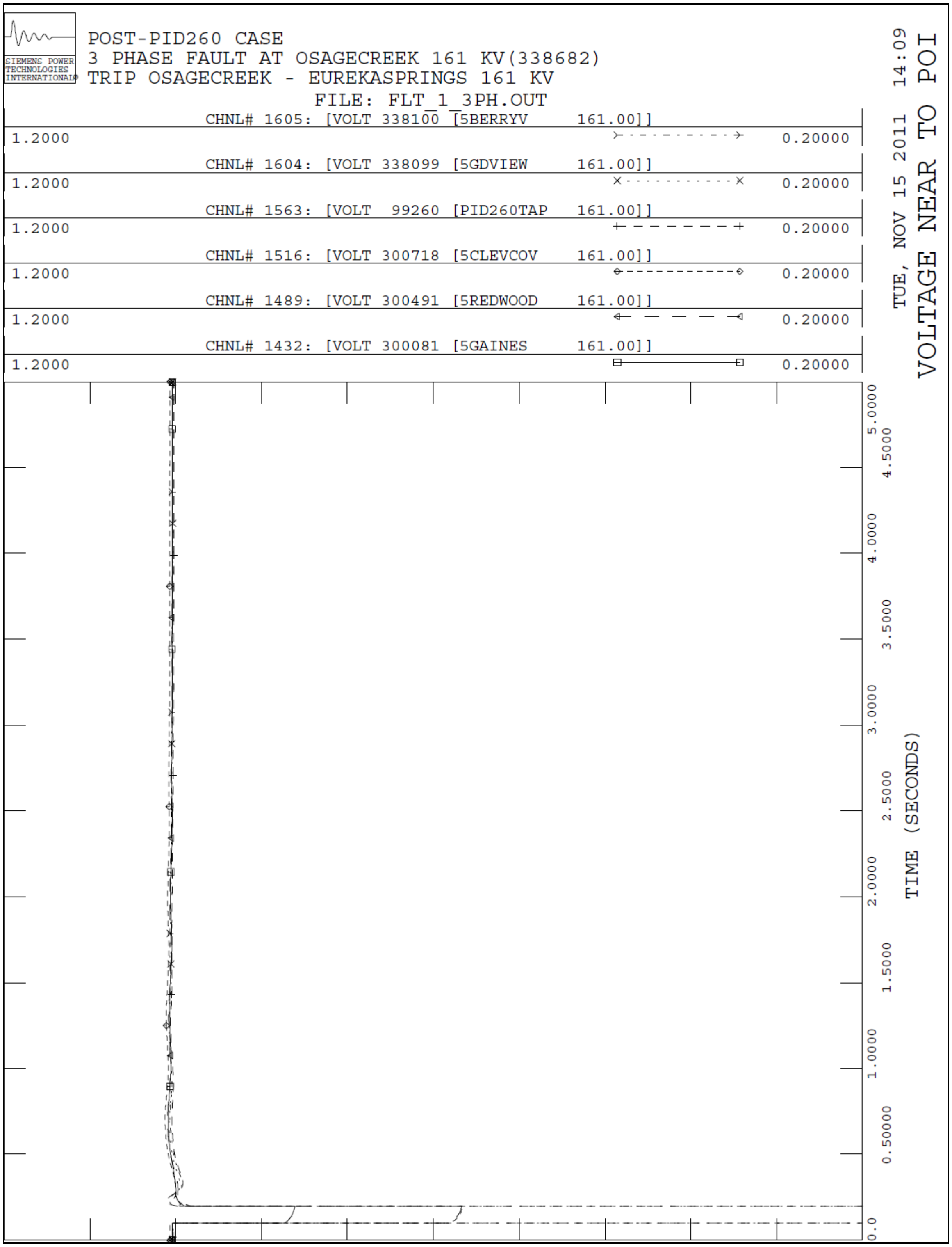


Figure 12.12: PID 260 Machine Variables for FLT_1_3PH

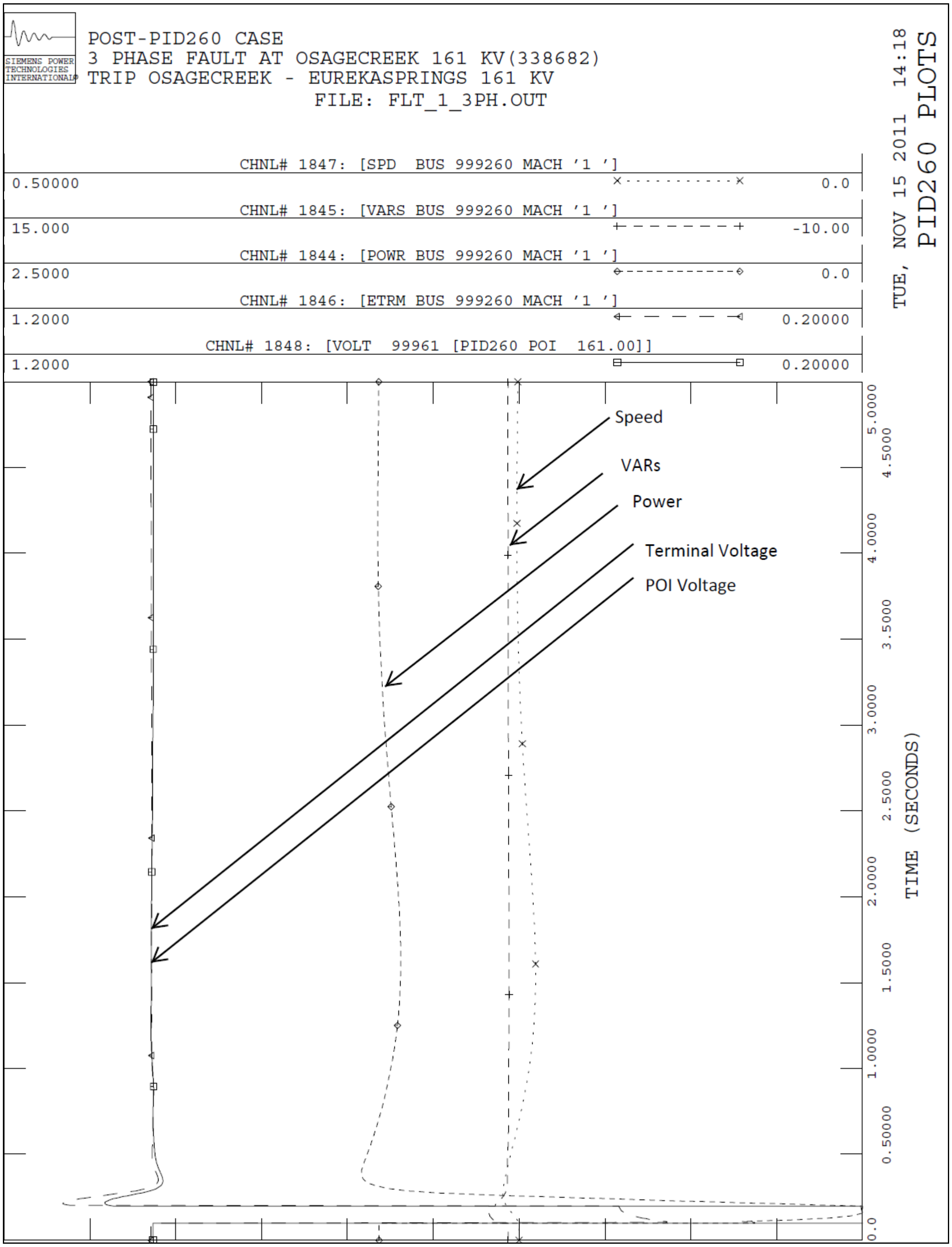


Table 12.3: Phase Normally Cleared and Stuck-breaker Faults Simulation Results

Fault #	Stable?	Acceptable Voltages?
Fault_1	YES	YES
Fault_2	YES	YES
Fault_3	YES	YES
Fault_4	YES	YES
Fault_5	YES	YES
Fault_6	YES	YES
Fault_7	YES	YES
Fault_8	YES	YES
Fault_9	YES	YES
Fault_10	YES	YES
Fault_11	YES	YES
Fault_12	YES	YES
Fault_13	YES	YES
Fault_14	YES	YES
FAULT_15	YES	YES
FAULT_3a	YES	YES
FAULT_6a	YES	YES
FAULT_9a	YES	YES
FAULT_12a	YES	YES
FAULT_16	YES	YES
FAULT_17	YES	YES
FAULT_18	YES	YES
FAULT_19	YES	YES
FAULT_20	YES	YES

12.4 LOW VOLTAGE RIDE THROUGH (LVRT)

As discussed in Section 10, the proposed project was modeled with low voltage ride through capability. The point of interconnection (POI) of the proposed wind farm is on the Grandview–Osage Creek 161kV line. The post-transition period LVRT capability of the project was verified by simulating two (2) separate three-phase faults at 161kV POI, clearing one line at a time.

- FLT_1_3PH -LVRT: 9 cycle, 3 phase fault at POI 161kV and cleared by tripping POI – Grandview 161kV line
- FLT_2_3PH -LVRT: 9 cycle, 3 phase fault at POI 161kV and cleared by tripping POI – Osage Creek 161kV line

As shown in Figure 12.13 and Figure 12.14, the wind turbine generator remains on-line for both fault cases. Therefore, the LVRT requirement is met.

Figure 12.13: LVRT Capability of PID 260 for FLT_1_3PH –LVRT

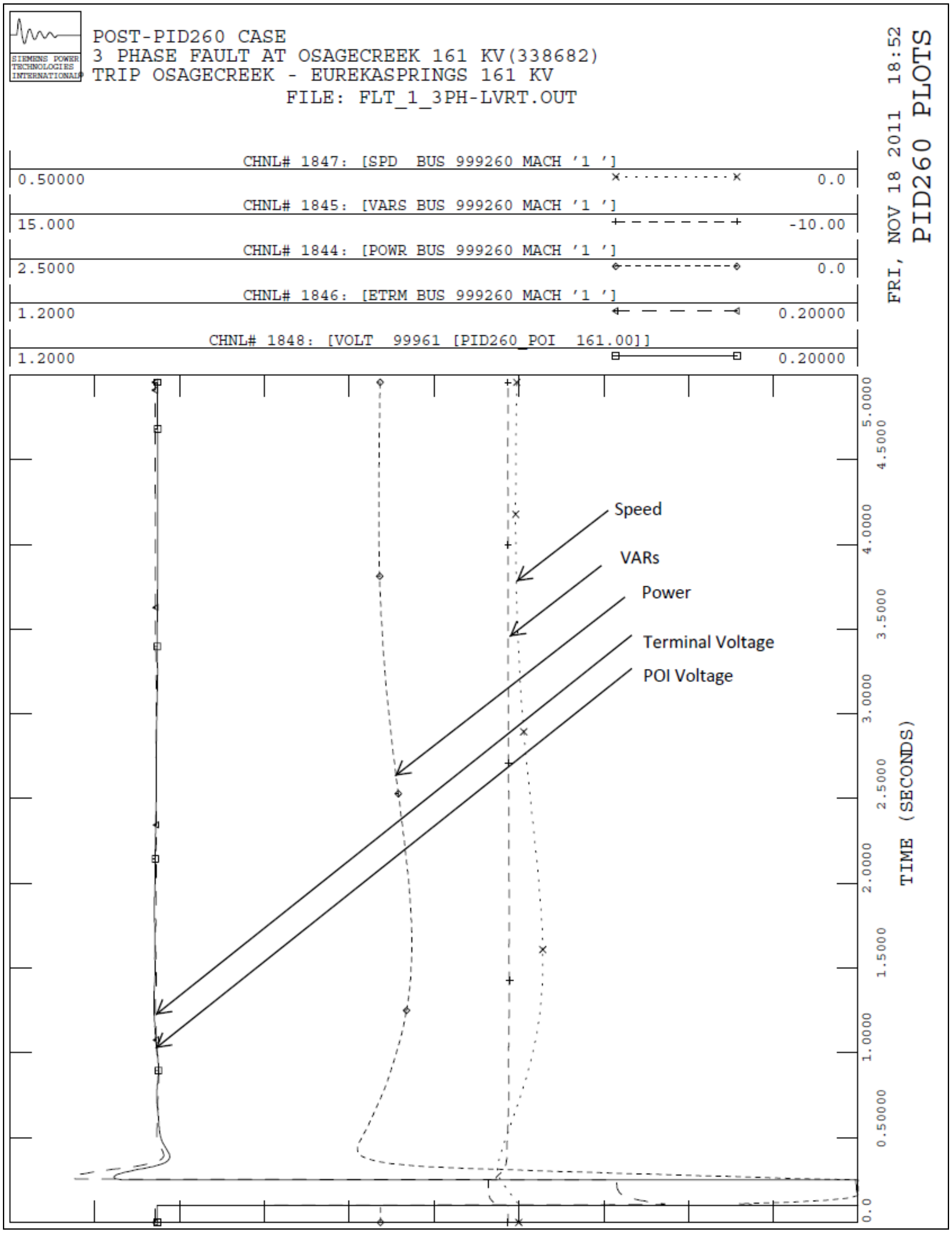
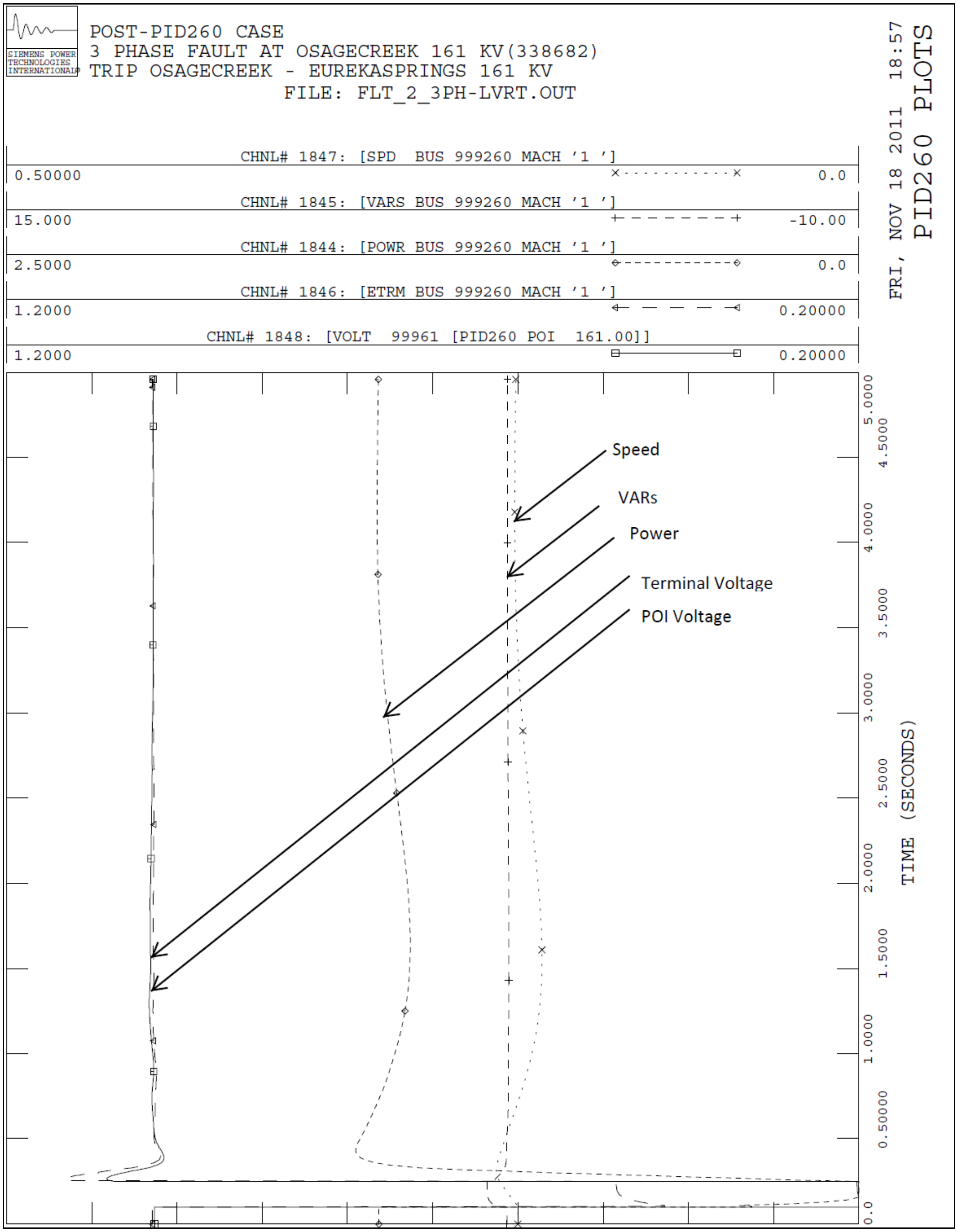


Figure 12.14: LVRT Capability of PID 260 for FLT_2_3PH –LVRT



13. Project Description

The proposed PID 260 project will be located in Carroll County, Arkansas. The power will be generated using 88 GE 1.6 MW wind-turbine generators.

The following list summarizes the major project parameters:

Interconnection Voltage: 161kV

Location: Midway on the Grandview–Osage Creek 161kV line

Substation Transformer:

- MVA: 90/120/150 MVA
- High voltage: 161kV
- Low Voltage: 34.5kV
- Z: 10% on 90 MVA; X/R = 40

Wind turbines:

- Number: Eighty eight (88)
- Manufacturer: GE
- Wind turbine Generator: GE 1.6XLE 100m rotor
- Type: DFIG
- Rated power: 1.6 MW
- Reactive power capability: ± 69 MVAR
- Rated Terminal Voltage: 690 V
- Frequency: 60 Hz

Generator Step-up Transformer (GSU):

- MVA: 1.75 MVA
- High voltage: 34.5kV (Delta)
- Low voltage: 0.690kV (Wye grounded)
- Z: 5.75% on 1.75 MVA; X/R = 7.5

Low Voltage Ride Through Capability: The manufacturer recommended Low Voltage Ride Through (LVRT) settings were included (Refer Figure 12.15).

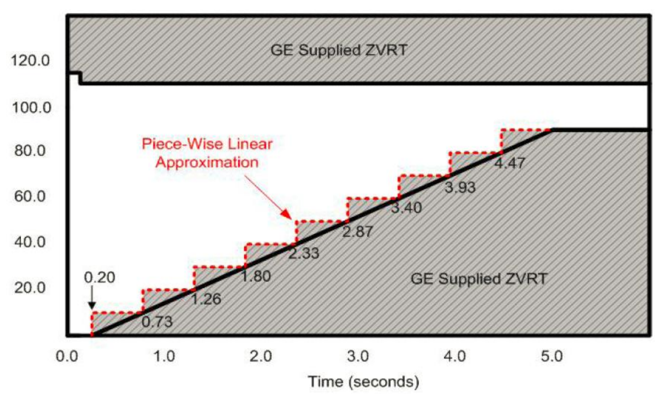


Figure 12.15: Transient Voltage/Frequency Ride Through Characteristics of GE 1.6 MW Wind Turbine Generator

APPENDIX A: Data Provided by the Customer

Entergy Services, Inc.
FERC Electric Tariff
Third Revised Volume No. 3

Original Sheet No. 382

Attachment A to Appendix 1
Interconnection Request

LARGE GENERATING FACILITY DATA

UNIT RATINGS

kVA 1828 °F 104 Voltage 690
Power Factor +/-.90
Speed (RPM) 1520 (Rated) Connection (e.g. Wye) Wye/Wye
Short Circuit Ratio ________ Frequency, Hertz 60Hz
Stator Amperes at Rated kVA 1300 Field Volts ________
Max Turbine MW 1.645 °F ______

COMBINED TURBINE-GENERATOR-EXCITER INERTIA DATA

Inertia Constant, H = ________ kW sec/kVA
Moment-of-Inertia, WR^2 = ________ lb. $ft.^2$

REACTANCE DATA (PER UNIT-RATED KVA)

	DIRECT AXIS		QUADRATURE AXIS	
Synchronous – saturated	X_{dv}	______	X_{qv}	______
Synchronous – unsaturated	X_{di}	______	X_{qi}	______
Transient – saturated	X'_{dv}	______	X'_{qv}	______
Transient – unsaturated	X'_{di}	______	X'_{qi}	______
Subtransient – saturated	X''_{dv}	______	X''_{qv}	______
Subtransient – unsaturated	X''_{di}	______	X''_{qi}	______
Negative Sequence – saturated	$X2_v$	______		
Negative Sequence – unsaturated	$X2_i$	______		
Zero Sequence – saturated	$X0_v$	______		
Zero Sequence – unsaturated	$X0_i$	______		
Leakage Reactance	Xl_m	______		

Issued by: Randall Helmick
Vice President, Transmission

Effective: July 13, 2007

Issued on: July 13, 2007

CURVES

Provide Saturation, Vee, Reactive Capability, Capacity Temperature Correction curves. Designate normal and emergency Hydrogen Pressure operating range for multiple curves.

GENERATOR STEP-UP TRANSFORMER DATA RATINGS

Capacity Self-cooled/ Maximum Nameplate
1750 / ______ kVA

Voltage Ratio(Generator Side/System side/Tertiary)
0.69/34.5 / ______ / ______ kV

Winding Connections (Low V/High V/Tertiary V (Delta or Wye))
Wye grounded / Delta / ______

Fixed Taps Available 2x+/-2.5%

Present Tap Setting 0% (Center Tap)

IMPEDANCE

Positive Z_1 (on self-cooled kVA rating) 5.75 % 7.5 X/R

Zero Z_0 (on self-cooled kVA rating) ______ % ______ X/R

EXCITATION SYSTEM DATA

Identify appropriate IEEE model block diagram of excitation system and power system stabilizer (PSS) for computer representation in power system stability simulations and the corresponding excitation system and PSS constants for use in the model.

GOVERNOR SYSTEM DATA

Identify appropriate IEEE model block diagram of governor system for computer representation in power system stability simulations and the corresponding governor system constants for use in the model.

WIND GENERATORS

Number of generators to be interconnected pursuant to this Interconnection Request:
88

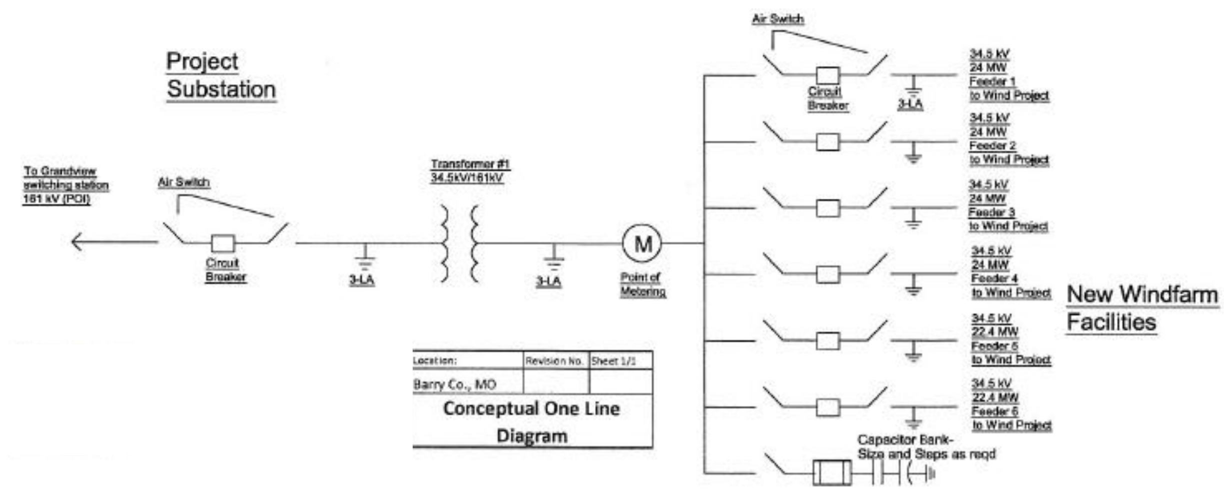
Elevation: 1400' ______ Single Phase X Three Phase

Inverter manufacturer, model name, number, and version:
GE 1.6 XLE (100m rotor)

List of adjustable setpoints for the protective equipment or software:
______

Note: A completed General Electric Company Power Systems Load Flow (PSLF) data sheet or other compatible formats, such as IEEE and PTI power flow models, must be supplied with the Interconnection Request. If other data sheets are more appropriate to the proposed device, then they shall be provided and discussed at Scoping Meeting.


Bentonville
13.70 mi
Image USDA Farm Service Agency
Image State of Arkansas
Barry
Stone
Grandview Switching Station (POI)
©2010 Google



Project
Substation
To Grandview
switching station
161 kV (POI)
Air Switch
Circuit
Breaker
3-LA
Transformer #1
34.5kV/161kV
3-LA
M
Point of
Metering
Air Switch
Circuit
Breaker
3-LA
34.5 kV
24 MW
Feeder 1
to Wind Project
34.5 kV
24 MW
Feeder 2
to Wind Project
34.5 kV
24 MW
Feeder 3
to Wind Project
34.5 kV
24 MW
Feeder 4
to Wind Project
34.5 kV
22.4 MW
Feeder 5
to Wind Project
34.5 kV
22.4 MW
Feeder 6
to Wind Project
Capacitor Bank-
Size and Steps as reqd
New Windfarm
Facilities
Location:
Revision No.
Sheet 1/1
Barry Co., MO
Conceptual One Line
Diagram

SAMPLE DATA REQUEST FOR WIND POWER PLANTS

1. One-line Diagram. This should be similar to Figure 1 below.

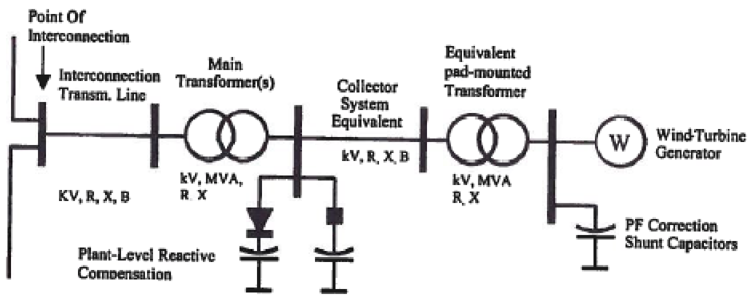


Figure A-1. Single-machine representation one-line diagram

2. Interconnection Transmission Line.

- Line voltage = 161 kV
- R = _______ ohm or 0.01897 pu on 100 MVA and line kV base (positive sequence)
- X = _______ ohm or 0.11126 pu on 100 MVA and line kV base (positive sequence)
- B = _______ uF or 0.0547 pu on 100 MVA and line kV base

3. Station Transformer. (NOTE: If there are multiple transformers, data for each transformer should be provided)

- Rating (ONAN/FA/FA): 90 /120 /150 MVA
- Nominal Voltage for each winding (Low /High /Tertiary): 34.5 /161 /_______ kV
- Winding Connections: Yg /Delta /_______ (Delta, Wye, Wye grounded)
- Available taps: 2x +/- 2.5%(fixed) (indicated fixed or ULTC), operating Tap: 0% (TBD)
- Positive sequence Z: 10 %, 40 X/R on transformer self-cooled (ONAN) MVA
- Zero sequence Z: _____%, ____X/R on transformer self-cooled (ONAN) MVA

4. Collector System Equivalent Model. This can be found by applying the equivalencing methodology described in Section 3.4; otherwise, typical values can be used.

- Collector system voltage = 34.5 kV
- R = ________ ohm or ______ pu on 100 MVA and collector kV base $R_1 = 0.0069$; $R_0 = 0.0157$
- X = ________ ohm or ______ pu on 100 MVA and collector kV base $X_1 = 0.0072$; $X_0 = 0.0028$
- B = ________ mF or ______ pu on 100 MVA and collector kV base $B = 0.0437$
- Attach a one-line diagram of the collector layout.

all per unit on 100MVA & 34.5kV base

5. Wind-turbine Generator (WTG) Pad-Mounted Transformer. Note: These are typically two-winding air-cooled transformers. If the proposed project contains different types or sizes of pad-mounted transformers, please provide data for each type.

- Rating: 1.75 MVA
- Nominal voltage for each winding (Low /High): 0.69 /34.5 kV
- Winding Connections: Yg /Delta (Delta, Wye, Wye grounded)
- Available taps: 2x +/-2.5%fix (please indicated fixed or ULTC), Operating Tap: Center
- Positive sequence impedance (Z1) 5.75 %, 7.5 X/R on transformer self-cooled MVA
- Zero sequence impedance (Z0) ____%, ____X/R on transformer self-cooled MVA

6. WTG Powerflow Data. Proposed projects may include one or more WTG Types (See NOTE 1 below). Please provide the following information for each:

- Number of WTGs: 88
- Nameplate rating (each WTG): 1.6 MW
- WTG Manufacturer and Model: GE 1.6XLE 100m rotor
- WTG Type: 3 (DFIG)

For Type 1 or Type 2 WTGs:
- Uncompensated power factor at full load: ______
- Power factor correction capacitors at full load: ______Mvar
- Number of shunt stages and size __________
- Please attach capability curve describing reactive power or power factor range from 0 to full output, including the effect of shunt compensation.

For Type 3 and Type 3 WTGs:
- Maximum under-excited power factor at full load: +/-.90
- Maximum under-excited power factor at full load: ______
- Control mode: capable of either (voltage control, fixed power factor) (See Note 7.2)
- Please attach capability curve describing reactive power or power factor range from 0 to full output. – see attached

NOTE 7.1: WTG Type can be one of the following:
- Type 1 – Squirrel-cage induction generator
- Type 2 – Wound rotor induction machine with variable rotor resistance
- Type 3 – Doubly-fed asynchronous generator
- Type 4 – Full converter interface

NOTE 7.2: Type 1 and Type 2 WTGs typically operate on **fixed power factor** mode for a wide range of output level, aided by turbine-side power factor correction capacitors (shunt compensation). With a suitable plant-level controller, Type 3 and Type 4 WTGs may be capable of dynamically varying power factor to contribute to **voltage control** mode operation, if required by the utility. However, this feature is not always available due to commercial and other reasons. The data requested must reflect the WTG capability that can be used in practice. Please consult with the manufacturer when in doubt. The interconnection study will determine the voltage control requirements for the project. Plant-level reactive compensation requirements are engineered to meet specific requirements. WTG reactive capability data described above could significantly impact study results and plant-level reactive compensation requirements.

7. Wind Farm Reactive Power Compensation. Provide the following information for wind farm-level reactive compensation, if applicable:

- Individual shunt capacitor and size of each: ______X______ MVA
- Dynamic reactive control device, (SVC, STATCOM): WindCONTROL™ - DVAR Control
- Control range ± 46.9 MVAR w/standard Mvar (lead and lag) or ± 69 MVAR w/expanded control range
- Control mode (line drop, voltage droop, voltage control): ____________
- Regulation point ____________
- Describe the overall reactive power control strategy:
  If SIS determines need, expect to use expanded power factor control range + static devices as need
  – see attached

8. Wind-turbine Generator (WTG) Dynamic Data. Model and parameter data required for transient stability analysis is specific to each WTG make and model. The dynamic models must be in an approved WECC format, or in a PSSE or PSLF format that is acceptable to the transmission provider. We strongly suggest that the manufacturers provide this information.

- Library model name: ____________
- Model type (standard library or user-written): ____________
- Model access (proprietary or non-proprietary): ____________
- Attach full model description and parameter data

Will request from manufacturer

~~Available upon request due to NDA with manufacturer.~~

APPENDIX B: Power Flow and Stability Data

Loadflow Data

```
99961 ,'PID260_POI ',  161.0000,1,     0.000,     0.000, 351, 163,1.0000, -22.0000,   1
 99960 ,'PID260COL  ',   34.5000,1,     0.000,     0.000, 351, 163,1.0000, -22.0000,   1
999261 ,'PID260GSU  ',   34.5000,1,     0.000,     0.000, 351, 163,1.0000, -22.0000,   1
999260 ,'PID260GEN  ',    0.6900,2,     0.000,     0.000,   1,   1,1.0000, -22.0000,   1
0 / END OF BUS DATA, BEGIN LOAD DATA
0 / END OF LOAD DATA, BEGIN GENERATOR DATA
999260,'1 ',   140.800,     0.000,68.200,     -68.200, 1.0000,    99960,   154.000,
0.00000,0.80000,  0.00000,  0.00000,1.00000,1,  100.0,   100.000,     0.000,   1,1.0000
0 / END OF GENERATOR DATA, BEGIN BRANCH DATA
99260 , 99961,'1 ',   0.01897,   0.11126,   0.05470,  150.00,  150.00,    0.00,  0.00000,
0.00000,  0.00000,  0.00000,1, 6.00,   1,1.0000
99960 ,999261,'1 ',   0.00690,   0.00720,   0.04370,  150.00,  150.00,    0.00,  0.00000,
0.00000,  0.00000,  0.00000,1, 6.00,   1,1.0000
0 / END OF BRANCH DATA, BEGIN TRANSFORMER DATA
 99961, 99960,     0,'1 ',1,2,1,   0.00000,   0.00000,2,'PID60SUB    ',1,   1,1.0000
   0.00250,   0.10000,    90.00
1.05000,   0.000,   0.000,    90.00,   120.00,   150.00,-2,      0, 1.05000,
0.95000,10.00000, 9.00000,  30, 0, 0.00000, 0.00000
1.00000,   0.000
999261,999260,     0,'1 ',1,2,1,   0.00000,   0.00000,2,'PID260GSU   ',1,   1,1.0000
   0.00768,   0.05750,   154.00
1.00000,   0.000,   0.000,   154.00,   154.00,   154.00,-1,      0, 1.05000, 0.95000,
1.02500, 1.00000,  30, 0, 0.00000, 0.00000
1.00000,   0.000
0 / END OF TRANSFORMER DATA, BEGIN AREA DATA
0 / END OF AREA DATA, BEGIN TWO-TERMINAL DC DATA
0 / END OF TWO-TERMINAL DC DATA, BEGIN VSC DC LINE DATA
0 / END OF VSC DC LINE DATA, BEGIN SWITCHED SHUNT DATA
0 / END OF SWITCHED SHUNT DATA, BEGIN IMPEDANCE CORRECTION DATA
0 / END OF IMPEDANCE CORRECTION DATA, BEGIN MULTI-TERMINAL DC DATA
0 / END OF MULTI-TERMINAL DC DATA, BEGIN MULTI-SECTION LINE DATA
0 / END OF MULTI-SECTION LINE DATA, BEGIN ZONE DATA
0 / END OF ZONE DATA, BEGIN INTER-AREA TRANSFER DATA
0 / END OF INTER-AREA TRANSFER DATA, BEGIN OWNER DATA
0 / END OF OWNER DATA, BEGIN FACTS DEVICE DATA
0 / END OF FACTS DEVICE DATA
```

Dynamics Data

```
PLANT MODELS

 REPORT FOR ALL MODELS                    BUS 999260 [PID260GEN   0.6900] MODELS


 ** GEWTG2 **  BUS X-- NAME --X   BASEKV MC  C O N S     S T A T E S        VAR
ICON
            999260    PID260GEN 0.6900 1  154444-154461  59535-59537   14802-14806
7527-7530

   PRATE        XEQ    VLVPL1    VLVPL2    GLVPL2   VHVRCR2
   1.6000       0.8    0.5000    0.9000    1.2200    1.2000

   CURHVRCR2 VLVACR1   VLVACR2   RIp_LVPL   T_LVPL     LVPL1V
   2.0000    0.4000    0.8000   10.0000    0.0200    0.0000


   LVPL1P   LVPL2V    LVPL2P    LVPL3V     LVPL3P     XLVPL
   0.0000    0.5000    0.1670    0.9000    0.9250    0.0000


 NUMBER OF AGGREGATED ORIGINAL WT UNITS:   88
 WT UNITS USE DFIGs
```

```
 ** GEWTE2 OF GEWTG **  BUS X-- NAME --X BASEKV MC       C O N S       S T A T E S
VAR          ICON
                        999260 PID260GEN    0.6900 1  154462-154528  59538-59555   14807-
14815    7531-7542

   TFV      KPV        KIV       RC        XC        TFP       KPP
   0.1500   18.0000    5.0000    0.0000    0.0000    0.0500    3.0000

   KIP      PMX        PMN       QMX       QMN       IPMAX     TRV
   0.6000   1.1200     0.0400    0.4360    -0.4360   1.1200    0.0200

   RPMX     RPMN       T_POWER   KQi       VMINCL    VMAXCL    KVi
   0.4500   -0.4500   60.0000    0.1000    0.9000    1.1000   40.0000

   XIQmin   XIQmax     Tv        Tp        Fn        TPav
   0.5000   1.4500     0.0500    0.0500    1.0000    0.1500

   FRa      FRb        FRc       FRd
   0.9600   0.9960     1.0040    1.0400

   PFRa     PFRb       PFRc      PFRd
   1.0000   0.9500     0.9500    0.4000

   PFRmax   PFRmin     TW        T_LVPL   V_LVPL
   1.0000   0.2000     1.0000    0.2500   -1.0000

   SPDW1    SPDWMX     SPDWMN    SPD_LOW  WTTHRES
  14.0000   25.0000    3.0000   -0.9000    8.0000

   EBST     KDBR       Pdbr_MAX
   0.2000   10.0000    1.0000

   ImaxTD   Iphl       Iqhl      TIpqd      Kqd      Xqd      Kwi
   1.7000   1.1200     1.2500    5.0000    0.0000    0.0000    0.0000

   dbwi     Tipwi      Twowi     urIwi     drIwi    Pmxwi      Pmnwi
   0.0025   1.0000     5.5000    0.1000    -1.0000   0.1000    0.0000

   Vermx    Vermn      Vfrz      QmxZP     QmnZP
   0.1000   -0.1000    0.7000    0.1200    -0.1200


 Remote controlled Bus #     99960
               VARFLG =  1 PFAFLG =  0
               APCFLG =  0 FRFLG =  0
               PQFLAG =  0 WindFREE Enabling Bit = 1
 Q Droop Branch FROM Bus=       0  TO Bus =       0  ID =  1


 **  GEWTT1 **  BUS X-- NAME --X BASEKV MC    C O N S     S T A T E S     V A R S
ICON
            999260    PID260GEN 0.6900 1  154529-154533  59556-59559   14816-14818
7543

     H           DAMP          Htfrac       Freq1       DSHAFT
    4.6300       0.0000       0.0000       1.8800       2.3000


      PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E      WED, OCT 19 2011  15:34


 CONEC MODELS

 REPORT FOR ALL MODELS                    BUS 999260 [PID260GEN   0.6900] MODELS


  ** GEWGC1 ** BUS X-- NAME --X     BASEKV MC    C O N S       V A R S        ICONS
            999260     PID260GEN    0.6900 1  154534-154539  14819-14822    7544-7546
```

```
 T1G          TG       MAXG       T1R      T2R       MAXR
 9999.000     5.000    30.000  9999.000  9999.000    30.000
              Wind generator Bus # 999260
              Wind Generator ID       1


 ** GEWTA1 for GEWTG **      BUS X-- NAME --X BASEKV MC    C O N S        STATE
VAR         ICON
                       999260 PID260GEN    0.6900 1  154540-154548   59560-59560   14823-
14826    7547-7549

    Lambda_Max      Lambda_Min   PITCH_MAX    PITCH_MIN      Ta         RHO
     20.0000       0.0000      27.0000      -4.0000       0.0000       1.2250

      Radius      GB_RATIO        SYNCHR
     35.2500      72.0000        1200.0000


              Wind Generator Bus # 999260
              Wind Generator ID       1


 ** GEWTP1 for GEWTG **  BUS X-- NAME --X BASEKV MC    C O N S         STATE         VAR
ICON
                       999260 PID260GEN    0.6900 1  154549-154558   59561-59563   14827-
14829    7550-7552

       Tp            Kpp        Kip           Kpc           Kic
      0.3000     150.0000      25.0000       3.0000      30.0000
        TetaMin   TetaMax   RTetaMin   RTetaMax    PMX
        -4.0000   27.0000  -10.0000   10.0000    1.0000


              Wind Generator Bus # 999260
              Wind Generator ID       1


  ** GEWPLT ** BUS X-- NAME --X    BASEKV MC       V A R S       ICONS
            999260    PID260GEN    0.69001       14830-14846    7553-7554


              Wind generator Bus # 999260
              Wind Generator ID       1

     PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS/E      WED, OCT 19 2011  15:34


 CONET MODELS

 REPORT FOR ALL MODELS                    BUS 999260 [PID260GEN   0.6900] MODELS


              *** CALL FRQTPA(  7555,154559,     0, 14847) ***

               BUS    NAME    BSKV      GEN BUS   NAME   BSKV   ID
            999260  PID260GE  .690      999260  PID260GE  .690    1

                  I C O N S      C O N S       V A R
                  7555-7560   154559-154562   14847

                    FLO       FUP      PICKUP     TB
                   56.500    62.500     1.000     0.080


              *** CALL VTGTPA(  7561,154563,     0, 14848) ***

               BUS   NAME  BSKV        GENR BUS   NAME  BSKV   ID
            999260 PID260GE.690          999260 PID260GE.690    1
```

```
     I C O N S     C O N S      V A R
     7561-7566   154563-154566   14848

       VLO       VUP      PICKUP     TB
       0.150     5.000     0.200     0.080


 *** CALL VTGTPA(  7567,154567,     0, 14849) ***

   BUS   NAME  BSKV        GENR BUS   NAME  BSKV   ID
999260 PID260GE.690          999260 PID260GE.690    1

     I C O N S     C O N S      V A R
     7567-7572   154567-154570   14849

       VLO       VUP      PICKUP     TB
       0.300     5.000     0.700     0.080


 *** CALL VTGTPA(  7573,154571,     0, 14850) ***

   BUS   NAME  BSKV        GENR BUS   NAME  BSKV   ID
999260 PID260GE.690          999260 PID260GE.690    1

     I C O N S     C O N S      V A R
     7573-7578   154571-154574   14850

       VLO       VUP      PICKUP     TB
       0.500     5.000     1.200     0.080


 *** CALL VTGTPA(  7579,154575,     0, 14851) ***

   BUS   NAME  BSKV        GENR BUS   NAME  BSKV   ID
999260 PID260GE.690          999260 PID260GE.690    1

     I C O N S     C O N S      V A R
     7579-7584   154575-154578   14851

       VLO       VUP      PICKUP     TB
       0.750     5.000     1.900     0.080


 *** CALL VTGTPA(  7585,154579,     0, 14852) ***

   BUS   NAME  BSKV        GENR BUS   NAME  BSKV   ID
999260 PID260GE.690          999260 PID260GE.690    1

     I C O N S     C O N S      V A R
     7585-7590   154579-154582   14852

       VLO       VUP      PICKUP     TB
       0.000     1.100     1.000     0.080


 *** CALL VTGTPA(  7591,154583,     0, 14853) ***

   BUS   NAME  BSKV        GENR BUS   NAME  BSKV   ID
999260 PID260GE.690          999260 PID260GE.690    1

     I C O N S     C O N S      V A R
     7591-7596   154583-154586   14853

       VLO       VUP      PICKUP     TB
       0.000     1.150     0.100     0.080
```

APPENDIX C: Plots for Stability Simulations

Plots will be posted in a separate posting titled *System Impact Study Report–Stability Plots Only*.

The plots can be viewed at the following link:

http://www.oatioasis.com/EES/EESDocs/interconnection_studies_ICT.htm

APPENDIX D: Prior Generation Interconnection and Transsmission Service Requests in Study Models

Prior Generation Interconnection NRIS requests that were included in this study:

PID	Substation	MW	In Service Date
PID 223	PID-223	125	10/1/2010
PID 224	PID-224	100	Suspended

Prior transmission service requests that were included in this study:

OASIS #		PSE	MW	Begin	End
74597193		NRG Power Marketing	300	1/1/2013	1/1/2018
74597198		NRG Power Marketing	300	1/1/2013	1/1/2018
74846159		AEPM	65	1/1/2015	1/1/2020

APPENDIX E: ERIS Load Flow - Details of Scenario 1, 2, 3, and 4

TABLE 1: DETAILS OF SCENARIO 1 RESULTS: (WITHOUT FUTURE PROJECTS AND WITHOUT PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
Bonin - Cecelia 138kV	11,760,000									X					
Brookhaven - Mallalieu (MEPA) 115kV	Included in 2011 ICT Base Plan											X			
Champagne - Plaisance (CLECO) 138kV	Other Ownership							X		X					
Coughlin - Plaisance 138kV (CLECO)	Other Ownership							X		X					
Evergreen – Pt. Pleasant 230kV	900,000									X					
Flander - Segura 138kV (CLECO)	Other Ownership									X					
Florence - South Jackson 115kV - Supplemental Upgrade	TBD											X			
French Settlement - Sorrento 230kV	7,200,000											X			
Habetz - Richard 138kV	Included in 2011 ICT Base Plan							X		X					
International Paper - Mansfield 138kV (CLECO)	Other Ownership		X												
International Paper - Wallake 138kV (CLECO)	Other Ownership		X												
Judice - Scott1 138kV	6,720,000									X					
Meaux - Abbeville 138kV	5,880,000									X					

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
Moril - Cecelia 138kV	21,000,000									X					
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Other Ownership							X		X					
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	TBD			X	X	X		X	X	X		X	X		X
Semere - Scott2 138kV	13,440,000							X		X					
Willow Glen – Pt. Pleasant 230kV	2,700,000									X					

TABLE 2: DETAILS OF SCENARIO 2 RESULTS: (WITHOUT FUTURE PROJECTS AND WITH PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
Bonin - Cecelia 138kV	11,760,000									X					
Brookhaven - Mallalieu (MEPA) 115kV	Included in 2011 ICT Base Plan											X			
Champagne - Plaisance (CLECO) 138kV	Other Ownership							X		X					
Coly - Vignes 230kV - Supplemental Upgrade	TBD									X					
Coughlin - Plaisance 138kV (CLECO)	Other Ownership							X		X					
Evergreen – Pt. Pleasant 230kV	900,000									X					
Flander - Segura 138kV (CLECO)	Other Ownership									X					
Florence - South Jackson 115kV - Supplemental Upgrade	TBD											X			
French Settlement - Sorrento 230kV	7,200,000											X			
Habetz - Richard 138kV	Included in 2011 ICT Base Plan							X		X					
International Paper - Mansfield 138kV (CLECO)	Other Ownership		X												

Limiting Elements	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
International Paper - Wallake 138kV (CLECO)	Other Ownership		X												
Jackson Miami - Rex Brown 115kV	1,680,000											X			
Judice - Scott1 138kV	6,720,000									X					
Meaux - Abbeville 138kV	5,880,000									X					
Moril - Cecelia 138kV	21,000,000									X					
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Other Ownership							X	X	X					
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	TBD			X	X	X		X	X	X		X	X		X
Semere - Scott2 138kV	13,440,000							X		X					
Willow Glen - Pt. Pleasant 230kV	2,700,000									X					

TABLE 3: DETAILS OF SCENARIO 3 RESULTS: (WITH FUTURE PROJECTS AND WITHOUT PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Element	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
Champagne - Plaisance (CLECO) 138kV	Other Ownership							X		X					
Coughlin - Plaisance 138kV (CLECO)	Other Ownership							X		X					
Florence - South Jackson 115kV - Supplemental Upgrade	TBD											X			
International Paper - Mansfield 138kV (CLECO)	Other Ownership		X												
International Paper - Wallake 138kV (CLECO)	Other Ownership		X												
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Other Ownership							X		X					
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	TBD			X	X	X		X	X	X		X	X		X
Richard - Acadia(EES) 138kV ckt 3	TBD							X							
Richard - Acadia(EES) 138kV ckt 4	TBD							X							

TABLE 4: DETAILS OF SCENARIO 4 RESULTS: (WITH FUTURE PROJECTS AND WITH PENDING TRANSMISSION SERVICE & STUDY REQUEST)

Limiting Element	Est. Cost	AECI	AEPW	AMRN	CLECO	EES	EMDE	LAFA	LAGN	LEPA	OKGE	SMEPA	SOCO	SPA	TVA
Bull Shoals - Midway AECC 161kV	7,830,000	X		X	X	X		X	X	X		X	X		X
Champagne - Plaisance (CLECO) 138kV	Other Ownership							X		X					
Coughlin - Plaisance 138kV (CLECO)	Other Ownership							X		X					
Florence - South Jackson 115kV - Supplemental Upgrade	TBD											X			
International Paper - Mansfield 138kV (CLECO)	Other Ownership		X												
International Paper - Wallake 138kV (CLECO)	Other Ownership		X												
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Other Ownership							X	X	X					
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	TBD			X	X	X		X	X	X		X	X		X
Richard - Acadia(EES) 138kV ckt 3	TBD							X							
Richard - Acadia(EES) 138kV ckt 4	TBD							X							

APPENDIX F: Details of Scenario 1 – 2015

AECI

Limiting Element	Contingency Element	ATC
NONE	NONE	141

AEPW

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1853
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1066

AMRN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1878

CLECO

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-2082

EES

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-888

EMDE

Limiting Element	Contingency Element	ATC
NONE	NONE	141

LAFA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-708
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-284
Habetz - Richard 138kV	Acadian - Bonin 230kV (LAFA)	-169
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-165
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-116
Semere - Scott2 138kV	Flander - Segura 138kV (CLECO)	-85
Habetz - Richard 138kV	Flander - Acadian 230kV (LAFA)	-56
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	2
Semere - Scott2 138kV	Habetz - Richard 138kV	49
Rapidies (CLECO) - Rodemacher (CLECO)	Rodemacher (CLECO) - Sherwood	76

Limiting Element	Contingency Element	ATC
230kV	(CLECO) 230kV	
Semere - Scott2 138kV	Wells 500/230kV transformer	115
Semere - Scott2 138kV	Richard - Scott1 138kV	116

LAGN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-731

LEPA

Limiting Element	Contingency Element	ATC
Bonin - Cecelia 138kV	Colonial Academy - Richard 138kV	-989
Bonin - Cecelia 138kV	Acadia GSU - Colonial Academy 138kV	-853
Bonin - Cecelia 138kV	Acadia GSU - Scanlan 138kV	-762
Habetz - Richard 138kV	Acadian - Bonin 230kV (LAFA)	-508
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-454
Moril - Cecelia 138kV	Flander - Segura 138kV (CLECO)	-380
Semere - Scott2 138kV	Bonin - Cecelia 138kV	-346
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-326
Bonin - Cecelia 138kV	Scanlan - Scott2 138kV	-325
Meaux - Abbeville 138kV	Flander - Segura 138kV (CLECO)	-324
Bonin - Cecelia 138kV	Semere - Scott2 138kV	-314
Bonin - Cecelia 138kV	Flander - Segura 138kV (CLECO)	-231
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-190
Habetz - Richard 138kV	Flander - Acadian 230kV (LAFA)	-167
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-134
Flander - Segura 138kV (CLECO)	Meaux - Abbeville 138kV	-103
Judice - Scott1 138kV	Meaux - SELLRD (CLECO) 230kV	-84
Moril - Cecelia 138kV	Meaux - Abbeville 138kV	-74
Judice - Scott1 138kV	Meaux 230/138kV transformer 1	-71
Willow Glen - PT. PLEASANT 230kV	Willow Glen - Evergreen 230kV ckt 1	-8
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	3
Flander - Segura 138kV (CLECO)	Leblanc - Abbyville 138kV	55
Moril - Cecelia 138kV	Leblanc - Abbyville 138kV	96
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	112
Flander - Segura 138kV (CLECO)	Meaux - SELLRD (CLECO) 230kV	130
Flander - Segura 138kV (CLECO)	Meaux 230/138kV transformer 1	132
Evergreen - PT. PLEASANT 230kV	Willow Glen - Evergreen 230kV ckt 1	139

OKGE

Limiting Element	Contingency Element	ATC
NONE	NONE	141

SMEPA

Limiting Element	Contingency Element	ATC
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-1463
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-1463
French Settlement - Sorrento 230kV	Fairview - Gypsy 230kV	-655
French Settlement - Sorrento 230kV	Fairview - Madisonville 230kV	-631
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-373
French Settlement - Sorrento 230kV	Front Street - Michoud 230kV	-334
Brookhaven - Mallalieu (MEPA) 115kV	Bogalusa - Franklin 500kV	-27
Brookhaven - Mallalieu (MEPA) 115kV	Bogalusa - Adams Creek 500/230kV transformer	-27
French Settlement - Sorrento 230kV	Front Street - Slidell 230kV	-2
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Franklin 500kV	72
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Adams Creek 500/230kV transformer	72

SOCO

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-616

SPA

Limiting Element	Contingency Element	ATC
NONE	NONE	141

TVA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-869

APPENDIX G: Details of Scenario 2 – 2015

AECI

Limiting Element	Contingency Element	ATC
None	None	141

AEPW

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1268
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-481

AMRN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-4403

CLECO

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-4881

EES

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-2082

EMDE

Limiting Element	Contingency Element	ATC
None	None	141

LAFA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1660
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-608
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-485
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-440
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-317
Habetz - Richard 138kV	Acadian - Bonin 230kV (LAFA)	-217
Semere - Scott2 138kV	Flander - Segura 138kV (CLECO)	-208
Coughlin - Plaisance 138kV (CLECO)	Wells (CLECO) - West Fork (CLECO) 230kV	-176
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-118

Limiting Element	Contingency Element	ATC
Habetz - Richard 138kV	Flander - Acadian 230kV (LAFA)	-103
Champagne - Plaisance (CLECO) 138kV	Wells (CLECO) - West Fork (CLECO) 230kV	-53
Semere - Scott2 138kV	Richard - Wells 500kV	-43
Semere - Scott2 138kV	Habetz - Richard 138kV	-42
Semere - Scott2 138kV	Richard - Scott1 138kV	24

LAGN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1714
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-244

LEPA

Limiting Element	Contingency Element	ATC
Bonin - Cecelia 138kV	Colonial Academy - Richard 138kV	-1074
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1064
Bonin - Cecelia 138kV	Acadia GSU - Colonial Academy 138kV	-937
Bonin - Cecelia 138kV	Acadia GSU - Scanlan 138kV	-846
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-698
Habetz - Richard 138kV	Acadian - Bonin 230kV (LAFA)	-651
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-557
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-505
Semere - Scott2 138kV	Bonin - Cecelia 138kV	-480
Moril - Cecelia 138kV	Flander - Segura 138kV (CLECO)	-477
Meaux - Abbeville 138kV	Flander - Segura 138kV (CLECO)	-419
Bonin - Cecelia 138kV	Scanlan - Scott2 138kV	-409
Bonin - Cecelia 138kV	Semere - Scott2 138kV	-397
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-363
Willow Glen - PT. PLEASANT 230kV	Willow Glen - Evergreen 230kV ckt 1	-348
Habetz - Richard 138kV	Flander - Acadian 230kV (LAFA)	-311
Bonin - Cecelia 138kV	Flander - Segura 138kV (CLECO)	-300
Coughlin - Plaisance 138kV (CLECO)	Wells (CLECO) - West Fork (CLECO) 230kV	-203
Evergreen - PT. PLEASANT 230kV	Willow Glen - Evergreen 230kV ckt 1	-201
Flander - Segura 138kV (CLECO)	Meaux - Abbeville 138kV	-197
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-174
Judice - Scott1 138kV	Meaux - SELLRD (CLECO) 230kV	-172
Moril - Cecelia 138kV	Meaux - Abbeville 138kV	-171
Judice - Scott1 138kV	Meaux 230/138kV transformer 1	-158
Champagne - Plaisance (CLECO) 138kV	Wells (CLECO) - West Fork (CLECO) 230kV	-61
Flander - Segura 138kV (CLECO)	Leblanc - Abbyville 138kV	-39
Moril - Cecelia 138kV	Leblanc - Abbyville 138kV	-1
Flander - Segura 138kV (CLECO)	Meaux - SELLRD (CLECO) 230kV	34

Limiting Element	Contingency Element	ATC
Flander - Segura 138kV (CLECO)	Meaux 230/138kV transformer 1	36
Coly - Vignes 230kV - Supplemental Upgrade	A.A.C. - Polsky Carville 230kV	96
Flander - Segura 138kV (CLECO)	Moril - Cecelia 138kV	120
Bonin - Cecelia 138kV	Meaux - Abbeville 138kV	121
Coly - Vignes 230kV - Supplemental Upgrade	A.A.C. - Licar 230kV	122

OKGE

Limiting Element	Contingency Element	ATC
None	None	141

SMEPA

Limiting Element	Contingency Element	ATC
French Settlement - Sorrento 230kV	Bogalusa - Franklin 500kV	-1240
French Settlement - Sorrento 230kV	Bogalusa - Adams Creek 500/230kV transformer	-1240
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-874
Brookhaven - Mallalieu (MEPA) 115kV	Bogalusa - Franklin 500kV	-183
Brookhaven - Mallalieu (MEPA) 115kV	Bogalusa - Adams Creek 500/230kV transformer	-183
French Settlement - Sorrento 230kV	Fairview - Gypsy 230kV	-19
French Settlement - Sorrento 230kV	Fairview - Madisonville 230kV	1
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Franklin 500kV	41
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Adams Creek 500/230kV transformer	41
Jackson Miami - Rex Brown 115kV	South Jackson 230/115kV transformer 1	141

SOCO

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1444

SPA

Limiting Element	Contingency Element	ATC
None	None	141

TVA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-2038

APPENDIX H: Details of Scenario 3 – 2015

AECI

Limiting Element	Contingency Element	ATC
None	None	141

AEPW

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1721
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-936

AMRN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1407
Carroll 230/138kV transformer (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-531
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Sheveport 345kV (CLECO)	-417

CLECO

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1477

EES

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-678

EMDE

Limiting Element	Contingency Element	ATC
None	None	141

LAFA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-510
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-256
Richard - Acadia(EES) 138kV ckt 3	Richard - Acadia(EES) 138kV ckt 4	-190
Richard - Acadia(EES) 138kV ckt 4	Richard - Acadia(EES) 138kV ckt 3	-181
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-126
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-80
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	50

Limiting Element	Contingency Element	ATC
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	80

LAGN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-547

LEPA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-338
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-280
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-138
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-88
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	54
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	109

OKGE

Limiting Element	Contingency Element	ATC
None	None	141

SMEPA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-279
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Adams Creek 500/230kV transformer	104
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Franklin 500kV	104

SOCO

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-460

SPA

Limiting Element	Contingency Element	ATC
None	None	141

TVA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-650

APPENDIX I: Details of Scenario 4 – 2015

AECI

Limiting Element	Contingency Element	ATC
Bull Shoals - Midway AECC 161kV	Independence SES - Moorefield 161kV	122

AEPW

Limiting Element	Contingency Element	ATC
International Paper - Mansfield 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-1133
International Paper - Wallake 138kV (CLECO)	Dolet Hills - S.W. Shreevport 345kV (CLECO)	-349

AMRN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-3917
Bull Shoals - Midway AECC 161kV	Independence SES - Moorefield 161kV	119

CLECO

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-4114
Bull Shoals - Midway AECC 161kV	Independence SES - Moorefield 161kV	125

EES

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1890
Bull Shoals - Midway AECC 161kV	Independence SES - Moorefield 161kV	116

EMDE

Limiting Element	Contingency Element	ATC
None	None	141

LAFA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1420
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-607
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-472
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-430
Richard - Acadia(EES) 138kV ckt 3	Richard - Acadia(EES) 138kV ckt 4	-337
Richard - Acadia(EES) 138kV ckt 4	Richard - Acadia(EES) 138kV ckt 3	-328
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-296

Limiting Element	Contingency Element	ATC
Coughlin - Plaisance 138kV (CLECO)	Wells (CLECO) - West Fork (CLECO) 230kV	-154
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-136
Champagne - Plaisance (CLECO) 138kV	Wells (CLECO) - West Fork (CLECO) 230kV	-19
Bull Shoals - Midway AECC 161kV	Independence SES - Moorefield 161kV	123

LAGN

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1523
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-258
Bull Shoals - Midway AECC 161kV	Independence SES - Moorefield 161kV	122

LEPA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-942
Coughlin - Plaisance 138kV (CLECO)	Cocodrie - Vil Plat 230kV	-663
Champagne - Plaisance (CLECO) 138kV	Cocodrie - Vil Plat 230kV	-516
Coughlin - Plaisance 138kV (CLECO)	Vil Plat - West Fork 230kV	-470
Champagne - Plaisance (CLECO) 138kV	Vil Plat - West Fork 230kV	-323
Rapidies (CLECO) - Rodemacher (CLECO) 230kV	Rodemacher (CLECO) - Sherwood (CLECO) 230kV	-186
Coughlin - Plaisance 138kV (CLECO)	Wells (CLECO) - West Fork (CLECO) 230kV	-168
Champagne - Plaisance (CLECO) 138kV	Wells (CLECO) - West Fork (CLECO) 230kV	-21
Bull Shoals - Midway AECC 161kV	Independence SES - Moorefield 161kV	121

OKGE

Limiting Element	Contingency Element	ATC
None	None	141

SMEPA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-776
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Adams Creek 500/230kV transformer	73
Florence - South Jackson 115kV - Supplemental Upgrade	Bogalusa - Franklin 500kV	73
Bull Shoals - Midway AECC 161kV	Independence SES - Moorefield 161kV	118

SOCO

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1282
Bull Shoals - Midway AECC 161kV	Independence SES - Moorefield 161kV	115

SPA

Limiting Element	Contingency Element	ATC
None	None	141

TVA

Limiting Element	Contingency Element	ATC
Ray Braswell - Baxter Wilson 500kV - Supplemental Upgrade	Franklin - Grand Gulf 500kV	-1811
Bull Shoals - Midway AECC 161kV	Independence SES - Moorefield 161kV	113

APPENDIX J: Deliverability Tests for Network Resource

Interconnection Service Resources

Overview

Entergy will develop a two-part deliverability test for customers (Interconnection Customers or Network Customers) seeking to qualify a Generator as an NRIS resource: (1) a test of deliverability "from generation", that is out of the Generator to the aggregate load connected to the Entergy Transmission system; and (2) a test of deliverability "to load" associated with sub-zones. This test will identify upgrades that are required to make the resource deliverable and to maintain that deliverability for a five year period.

The "From Generation" Test for Deliverability

In order for a Generator to be considered deliverable, it must be able to run at its maximum rated output without impairing the capability of the aggregate of previously qualified generating resources (whether qualified at the NRIS or NITS level) in the local area to support load on the system, taking into account potentially constrained transmission elements common to the Generator under test and other adjacent qualified resources. For purposes of this test, the resources displaced in order to determine if the Generator under test can run at maximum rated output should be resources located outside of the local area and having insignificant impact on the results. Existing Long-term Firm PTP Service commitments will also be maintained in this study procedure.

The "To Load" Test for Deliverability

The Generator under test running at its rated output cannot introduce flows on the system that would adversely affect the ability of the transmission system to serve load reliably in import-constrained sub-zones. Existing Long-term Firm PTP Service commitments will also be maintained in this study procedure.

Required Upgrades

Entergy will determine what upgrades, if any, will be required for an NRIS applicant to meet deliverability requirements pursuant to Appendix E.

Description of Deliverability Test

Each NRIS resource will be tested for deliverability at peak load conditions, and in such a manner that the resources it displaces in the test are ones that could continue to contribute to the resource adequacy of the control area in addition to the studied resources. The study will also determine if a unit applying for NRIS service impairs the reliability of load on the system by reducing the capability of the transmission system to deliver energy to load located in import-constrained sub-zones on the grid. Through the study, any transmission upgrades necessary for the unit to meet these tests will be identified.

Deliverability Test Procedure

The deliverability test for qualifying a generating unit as a NRIS resource is intended to ensure that 1) the generating resource being studied contributes to the reliability of the system as a whole by being able to, in conjunction with all other Network Resources on the system, deliver energy to the aggregate load on the transmission system, and 2) collectively all load on the system can still be reliably served with the inclusion of the generating resource being studied. The tests are conducted for "peak" conditions (both a summer peak and a winter peak) for each year of the 5-year planning horizon commencing in the first year the new unit is scheduled to commence operations.

Deliverability of Generation

The intent of this test is to determine the deliverability of a NRIS resource to the aggregate load on the system. It is assumed in this test that all units previously qualified as NRIS and NITS resources are deliverable. In evaluating the incremental deliverability of a new resource, a test case is established. In the test case, all existing NRIS and NITS resources are dispatched at an expected level of generation (as modified by the DFAX list units as discussed below). Peak load withdrawals are also modeled as well as net imports and exports. The output from generating resources is then adjusted so as to "balance" overall load and generation. This sets the baseline for the test case in terms of total system injections and withdrawals.

Incremental to this test case, injections from the proposed new generation facility are then included, with reductions in other generation located outside of the local area made to maintain system balance.

Generator deliverability is then tested for each transmission facility. There are two steps to identify the transmission facilities to be studied and the pattern of generation on the system:

1) Identify the transmission facilities for which the generator being studied

has a 3% or greater distribution factor.

2) For each such transmission facility, list all existing qualified NRIS and

NITS resources having a 3% or greater distribution factor on that facility.

This list of units is called the Distribution Factor or DFAX list.

For each transmission facility, the units on the DFAX list with the greatest impact are modeled as operating at 100% of their rated output in the DC load flow until, working down the DFAX list, a 20% probability of all units being available at full output is reached (e.g. for 15 generators with a Forced Outage Rate of 10%, the probability of all 15 being available at 100% of their rated output is 20.6%). Other NRIS and NITS resources on the system are modeled at a level sufficient to serve load and net interchange.

From this new baseline, if the addition of the generator being considered (coupled with the matching generation reduction on the system) results in overloads on a particular transmission facility being examined, then it is not "deliverable" under the test.

Deliverability to Load

The Entergy transmission system is divided into a number of import constrained sub-zones for which the import capability and reliability criteria will be examined for the purposes of testing a new NRIS resource. These sub-zones can be characterized as being areas on the Entergy transmission system for which transmission limitations restrict the import of energy necessary to supply load located in the sub-zone.

The transmission limitations will be defined by contingencies and transmission constraints on the system that are known to limit operations in each area, and the sub-zones will be defined by the generation and load busses that are impacted by the contingent transmission lines. These sub-zones may change over time as the topology of the transmission system changes or load grows in particular areas.

An acceptable level of import capability for each sub-zone will have been determined by Entergy Transmission based on their experience and modeling of joint transmission and generating unit contingencies. Typically the acceptable level of transmission import capacity into the sub-zones will be that which is limited by first-contingency conditions on the transmission system when generating units within the sub-region are experiencing an abnormal level of outages and peak loads.

The "deliverability to load" test compares the available import capability to each sub-zone that is required for the maintaining of reliable service to load within the sub-zone both with and without the new NRIS resource operating at 100% of its rated output. If the new NRIS resource does not reduce the sub-zone import capability so as to reduce the reliability of load within the sub-zone to an unacceptable level, then the deliverability to load test for the unit is satisfied. This test is conducted for a 5-year planning cycle. When the new NRIS resource fails the test, then transmission upgrades will be identified that would allow the NRIS unit to operate without degrading the sub-zone reliability to below an acceptable level.

Other Modeling Assumptions

Modeling of Other Resources

Generating units outside the control of Entergy (including the network resources of others, and generating units in adjacent control areas) shall be modeled assuming “worst case” operation of the units – that is, a pattern of dispatch that reduces the sub-zone import capability, or impact the common limiting flowgates on the system to the greatest extent for the “from generation” deliverability test.

Must-run Units

Must-run units in the control area will be modeled as committed and operating at a level consistent with the must-run operating guidelines for the unit.

Base-line Transmission Model

The base-line transmission system will include all transmission upgrades approved and committed to by Entergy Transmission over the 5-year planning horizon. Transmission line ratings will be net of TRM and current CBM assumptions will be maintained.